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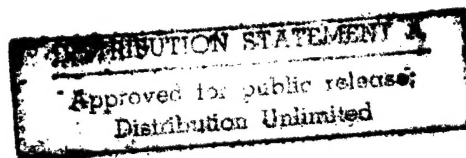
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# USSR Report

LIFE SCIENCES

BIOMEDICAL AND BEHAVIORAL SCIENCES



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6 September 1984

USSR REPORT  
LIFE SCIENCES  
BIOMEDICAL AND BEHAVIORAL SCIENCES

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PHYSICAL TRAINING OF COSMONAUTS FOR INTERCOSMOS PROGRAM MISSIONS

Moscow TEORIYA I PRAKTIKA FIZICHESKOY KUL'TURY in Russian No 4, Apr 84  
(signed to press 30 Mar 84) pp 22-24

[Article by A. V. Sedov, doctor of medical sciences, and A. S. Suvorov, candidate of pedagogic sciences, Institute of Biophysics, USSR Ministry of Health and Center for Cosmonaut Training imeni Yu. A. Gagarin]

[Text] The results of missions made by Soviet and American cosmonauts revealed that the human body generally adapts well to the unique spaceflight conditions. However, some cosmonauts developed changes indicative of the fact that spaceflight factors and, first of all, weightlessness could have an adverse effect on man.

It is virtually impossible to reproduce total weightlessness on the ground. But man encounters some signs of partial weightlessness in everyday life. We refer to riding on a swing, jumping, running and coming down in an elevator. In the course of evolutionary development man adapted to weight or gravity, and for this reason weightlessness cannot be indifferent to him.

Weightlessness alters the conditions under which the cardiovascular system functions [1, 3, 6]. This happens because, in the absence of gravity, blood is redistributed to vessels of the upper half of the body. A change is seen in human external respiration and exchange of gases under the influence of weightlessness, particularly in the acute period of adaptation [9, 13]. Functional disturbances of the skeletomuscular system occupy an important place in the set of disorders caused by reduced gravity loads. A decrease in muscle tone, impairment of vertical stability, muscular atrophy and other deviations have been observed [4, 11, 14]. Evidently, the diminished static load and related change in influx of static afferentation is one of the causes of these changes.

In the opinion of Prof N. M. Rudnyy, "absence of body weight is a predisposing factor for development of general deconditioning and related decrease in physical work capacity and tolerance of work loads" [7].

During long-term orbital flights, the human body gradually adapts to weightlessness. However, along with long-duration missions, it is often necessary for man to spend a short time (up to 15 days) in space, i.e., the initial period of adaptation to weightlessness, when the body's reactions are the most marked.

For this reason, it became necessary to develop a scientifically validated set of preventive measures aimed at preserving a sufficiently high level of work capacity and health of cosmonauts under the extreme conditions of orbital flights lasting up to 15 days. In particular, this task existed when preparing international crews on the Intercosmos Program, which involved a mission of 7-8 days.

Among the measures directed toward control of adverse consequences of weightlessness, preflight physical training of cosmonauts was very important. The purpose of this training was to enhance man's resistance to spaceflight factors and, first of all, weightlessness.

In 1976, V. Remek (CSSR), M. Hermaszewski (Polish People's Republic) and S. Jaehn (GDR) participated in the training course on the flight program for the manned Soyuz spacecraft and Salyut orbital station at the Center for Cosmonaut Training imeni Yu. A. Gagarin. And, starting in 1978, G. Ivanov (People's Republic of Bulgaria), B. Farkas (Hungarian People's Republic), Fam Tuan (Socialist Republic of Vietnam), A. Tamayo Mendes (Cuba), Zh. Gurragcha (Mongolian People's Republic) and D. Prunariu (Socialist Republic of Romania) underwent training on the Intercosmos Program for manned spaceflights.

General and special physical training was pursued with consideration of previously elaborated recommendations [8, 10, 12]. The physical training, which lasted 1-1.5 years for members of international crews, was performed 2-3 times a week, for 2 h at a time. The experience of sports physiology was also used, which had convincingly proven the efficacy of combining physical training with hypoxic factors for rapid increase in work capacity [21].\* In addition, cosmonaut training was directed toward enhancing resistance to weightlessness, for which purpose an antiorthostatic load [head-down tilt] and vestibular conditioning were used.

The cosmonauts performed various exercises on a revolving wheel, "loping" [?] and slant board in head-down position; they did somersaults on a trampoline and ran on a treadmill. They worked on wall bars, swam in a pool and ran over forest paths, they worked for long periods of time also on a combined exerciser which develops different muscle groups. USSR pilot-cosmonaut N. N. Rukavishnikov, twice the recipient of the title of Hero of the Soviet Union, who was on three missions in space, observes: "When you work on this exerciser for about an hour, you feel like you've been pumping iron, exercising on rings, paddled with oars, rode a bicycle and worked on a horizontal bar."

One of the authors of this article supervised the athletic training of cosmonauts. The level of general physical training was checked by means of exercises that characterize development of force and force endurance (chin-ups), static endurance (static wall sits), general endurance (3-km cross-country run) and speed (100-m run). The Table lists data on changes in these indicators; it shows that all of the cosmonauts improved appreciably their force, endurance and speed indicators as a result of physical training. For example, V. Remek improved his time by 40 s in the 3-km cross-country race, and his speed qualities also improved.

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\*Translator's note: Obvious typo, since bibliography does not go as high as this number.

# Dynamics of some of the cosmonauts' parameters under the influence of physical training

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V. Remek	11.43*/11.03**	13.9/13.6
M. Hermaszewski	13.48/12.36	14.5/14.0
S. Jaehn	13.51/12.47	14.2/13.8
G. Ivanov	13.08/12.24	14.3/13.7
B. Farkas	12.00/11.33	13.8/13.3
Fam Tuan	13.19/12.07	13.7/13.4
A. Tamayo Mendes	13.27/12.40	11.2/13.7
Zh. Gurragcha	13.32/12.55	14.5/13.8
D. Prunariu	13.06/12.10	13.9/13.4

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\*At the start of training.

\*\*Start--before mission.

There was substantial improvement of physical condition of other cosmonauts also who represented socialist countries. For example, D. Prunariu and Fam Tuan did 12 chin-ups just prior to a mission, B. Farkas did 13 and S. Jaehn did 15. Static endurance improved by several times. A. Tamayo Mendes, Zh. Gurragcha and Fam Tuan held a static wall-sit for 20 s at the end of the training period, versus 7-12 s before they started. D. Prunariu, the youngest of this group of cosmonauts (born in 1952) held the wall sit for 29 s.

The sports trainers and physicians devoted much attention to increasing the cosmonauts' general endurance. While most cosmonaut candidates ran the 3-km cross-country distance in over 13 min before arriving in Zvezdnyy village, 1 year later they were much faster, and the oldest of this group, S. Jaehn (born in 1937) and M. Hermaszewski (born in 1941), improved their time by more than 1 min.

The speed qualities were tested in sprinter races during cosmonaut training. The cosmonauts improved their time for 100 m by 0.3-0.7 s under the influence of training.

At the final stage of preflight training on the Intercosmos Program, joint training began for cosmonauts from socialist countries. Special attention was devoted at this stage to athletic training, as well as special training.

V. Remek, M. Hermaszewski and S. Jaehn were to be the first members of the international crew. Pilot-cosmonauts A. A. Gubarev, P. I. Klimuk and V. F. Bykovskiy, who were already experienced cosmonauts, trained with them. They were all comprehensively well-trained physically and they helped their friends from socialist countries to acquire a good form before the mission. In addition to regular exercises, A. A. Gubarev and P. I. Klimuk devoted quite a bit of attention to sports games, which helped establish closer contact with their partners.

Other international crews were also training for launches in Zvezdnyy at the same time: G. Ivanov together with N. N. Rukavishnikov, B. Farkas with V. N.

Kubasov, Fam Tuan with V. V. Gorbatko, A. Tamayo Mendes together with Yu. V. Romanenko, Zh. Gurragcha with V. A. Dzhanibekov and D. Prunariu with L. I. Popov. The Soviet cosmonauts transmitted to their foreign colleagues not only professional skills, but tried to help them acquire the reserve of physical strength needed for the mission.

In the period from March 1978 to May 1981, 9 international crews flew aboard Soviet spacecraft of the Soyuz series and the Salyut-5 scientific orbital station. Cosmonauts from CSSR, Poland, GDR, Bulgaria, Hungary, the People's Republic of Vietnam, Cuba, Mongolian People's Republic and Romania worked together with USSR cosmonauts in near-earth orbit. The good physical training of members of international crews was largely instrumental in the fact that there was good adaptation to weightlessness and, for the duration of the missions, the cosmonauts retained rather high work capacity. All this made it possible to complete the extensive program of research and experiments, which had been prepared by scientists of socialist countries. In particular, this program answered many questions of space and sports medicine.

Among the studies conducted in orbital missions on the Intercosmos Program, much attention was devoted to demonstration of reserve capacities of the body, a problem that is of equal concern to representatives of both space and sports medicine.

In this respect, some rather interesting studies were made by the international crew (L. I. Popov, V. V. Ryumin, V. N. Kubasov and B. Farkas) which fulfilled for 7 days the scientific program prepared jointly by USSR and Hungarian scientists and specialists. The "Work Capacity" experiment was an important part of this program; it assessed the basic characteristics of operators: speed and precision of reactions, resistance to interference and volume of processed information. These parameters reflected the state of mental and motor functions of cosmonauts, as well as their work capacity at a specific stage of performance.

The international crew, consisting of V. V. Gorbatko, commander, and Fam Tuan, civilian scientist-cosmonaut from the People's Republic of Vietnam, with L. I. Popov and V. V. Ryumin, performed the program of experiments and research prepared by scientists and specialists of the USSR and People's Republic of Vietnam, in collaboration with specialists from other socialist countries that were participants in the Intercosmos Program. During this mission, a series of "Circulation" experiments was performed. The purpose of this biomedical program was to study functional changes in the human circulatory system in the acute period of adaptation. Experiments were conducted using graded physical loads, use of lower body negative pressure and the Pnevmatik [pneumatic] device which is one of the possible means of controlling the process of redistribution of blood which occurs in weightlessness. In the "Respiration" experiment, with use of the Pnevmatik instrument developed by GDR specialists, studies were made of changes in external respiration of cosmonauts at the first stage of adaptation to weightlessness and with return earth's gravity. V. A. Dzhanibekov and Zh. Gurragcha also performed several medical experiments to investigate the distinctions of the body's adaptation to weightlessness, which enabled them to assess more completely the functional reserves of the body and condition of compensatory and adaptive mechanisms of the cardiorespiratory system. The obtained data are of definite value, not

only to cosmonautics, but sports. Speaking of the connection between space and "terrestrial" medicine, A. A. Leonov, Maj Gen Avn, twice recipient of the title of Hero of the Soviet Union, USSR pilot-cosmonaut, deputy chief of the Center for Cosmonaut Training, who is an ardent propagandist of physical culture and sports, observed that "space medicine, which had taken much from its sister, sports medicine, at one time to train the first cosmonauts, did not remain in her debt and generously shared all of the accumulated scientific and methodological material for grooming outstanding Soviet athletes" [5].

As a result of the selfless work of Soviet cosmonauts and cosmonauts from other socialist countries, valuable scientific information was obtained, which made it possible to broaden our knowledge about the reserve capabilities of the human body and deepen our knowledge not only in the area of space medicine, but sports medicine. The integrated preflight training of cosmonauts, which included regular physical exercise, which was developed by sports trainers and physicians, was largely instrumental in successful completion of the missions of international crews.

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fizicheskoy kul'tury", 1984

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CSO: 1840/1059

UDC 581.19.547.96

EFFECTS OF PROLONGED WEIGHTLESSNESS ON ORCHIDACEAE PROTEINS

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 5, May 84  
(manuscript received 12 Sep 83) pp 78-80

CHEREVCHENKO, T. M., SHMIGOVSKAYA, V. V., KOSAKOVSKAYA, I. V. and  
CHERNYAD'YEV, I. I., TsRBS [expansion unknown], Ukrainian SSR Academy of  
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[Abstract] The effects of long-term weightlessness (up to 6 months) on the electrophoretic mobility of soluble and structural proteins and D-ribulose-1,5-diphosphate carboxylase activity of the family Orchidaceae were studied in the leaves of five species: *Epidendrum radicans*, *Doritis pulcherrima*, *Haemaria discolor*, *Paphiopedillum insigne* and *Physosiphon loddigesii*. Prolonged weightlessness induced an increase in the number rapidly-migrating soluble and structural proteins in the case of *Epidendrum*, *Haemaria*, and *Physosiphon*. In *Paphiopedillum*, the number of rapidly-migrating fractions decreased, and, in *Doritis*, the number remained essentially unchanged. All changes were reversible, as shown by studies conducted 12 months after weightlessness was terminated. Activities of carboxylase were depressed only in *Haemaria* and *Physosiphon*, while the activities in the other species remained refractory to change or actually showed an increase (*Doritis*, *Epidendrum*) after termination of exposure. Weightlessness was thus shown to significantly affect orchid metabolism, including photosynthesis. References 3 (Russian).

[673-12172]

## AGROTECHNOLOGY

### PERMANENT COMMISSIONS OF TURKMEN SSR SUPREME SOVIET

Ashkhabad TURKMENSKAYA ISKRA in Russian 8 Jun 84 p 2

#### Turkmeninform report

[Abstract] A joint meeting of the Turkmen SSR Supreme Soviet permanent commissions for agriculture and nature conservation, people's education and science took place 7 June 1984 in Ashkhabad. Biological methods, dealing with agricultural pests, and their role in environmental protection, were discussed. It was noted that the Turkmen Ministry of Agriculture and its scientific research institutes and other interested parties are implementing the guidelines set by the 26th CPSU Congress aimed at making more effective use of biological methods in protecting agricultural crops and in nature conservation. In recent years work has expanded to develop and introduce a plant-protection program using mainly biological methods, thus making it possible to reduce or completely eliminate the use of chemicals. Biological laboratories have been established, in particular in Chardzhou Oblast, to produce trichogramma. At the same time, shortcomings in this work are noted. In particular, in 1983 only 17.4% of areas sown to cotton in Mary Oblast were treated using biological methods. Biological methods are still not being used to protect cereals and pulses, melons and grapes, and their use for fruits and roots crops is only negligible, while the amounts of pesticides used continue to grow. No centralized plan has been drawn up to provide laboratories with essential equipment, and methodology is lacking. The commission for agriculture and nature conservation recommended that the appropriate ministries and departments and the Turkmen Academy of Sciences take the necessary steps to develop resources for the extensive use of biological plant-protection methods. The commission on public health, also in session, dealt with matters of pensions for war invalids; the construction commission discussed the construction of social and everyday projects. A joint meeting of the commission for physical culture and sports and for youth affairs also took place in the same day to discuss the operation of sports facilities in Kushki and Kushkinskiy rayon. No references.  
[660-9642]

## AGRICULTURAL COOPERATION

Moscow KOMSOMOL'SKAYA PRAVDA in Russian 19 Jun 84 p 3

REPIN, L., special correspondent, KOMSOMOL'SKAYA PRAVDA

[Abstract] Coverage is given to the branch of the Institute of Livestock Physiology of the Slovak Academy of Sciences located in the village of Ivanka-on-Danube. As described by Koloman Bodya, director of the Institute, the wide range of research activities with which the branch is concerned is not limited to practical projects designed to meet agricultural needs, but also encompasses fundamental research in molecular biology, genetics, bioenergetics, cellular biology, and so forth. One important research area deals with the effects of environmental factors, such as stress or weightlessness, on the animal body. Studies with several avian species, conducted in cooperation with Soviet scientists, have shown the positive effects that weightlessness can have on avian physiology and egg-laying. This has included studies of the reproductive function of such birds aboard Cosmos spaceships, and brings closer the day when humans in outer space can be supplied with fresh meat and milk. Close cooperation between the scientists of the two countries has resulted in a considerable economy of effort and of valuable resources, and greatly improved the quality of research.  
[671-12172]

UDC 575.24:517

## INDUCED MUTABILITY OF CREPIS CAPILLARIS CHROMOSOMES DURING SEED STORAGE AND DNA SYNTHESIS MODIFICATION. II

Yerevan BIOLOGICHESKIY ZHURNAL ARMENII in Russian No 2, Feb 84  
(manuscript received 13 Jun 83) pp 97-99

MIRZOYAN, G. I., All-Union Scientific Research Institute of Nature Protection and National Parks Matters, USSR Ministry of Agriculture; Laboratory of Complex Problems of Nature Protection of Armenia

[Abstract] Study of the effect of 5-fluoro-2-desoxyuridine (FUDR) in G<sub>1</sub> and G<sub>2</sub> phases of the cell cycle on the number and spectrum of chromosome aberrations in *Cr. capillaris* seeds treated by the functional agent HN<sub>2</sub> and stored in a dry state for 1-60 days is described and discussed. Mutagenic effect of HN<sub>2</sub> was represented by a wave-form process. The number of chromosome aberrations during storage of the dry seeds increased regularly in proportion to the time lapse between treatment and germination. Mutability increased 1.5-fold by the 60th day of storage. The picture of the modifying effect of FUDR in the G<sub>1</sub> phase was almost the same as that in the G<sub>2</sub> phase. FUDR modifies the effect of the HN<sub>2</sub>, during a super-additive effect in both phases in all periods of storage. Thymidine, added to water simultaneously with FUDR, suppresses the effect of the latter but has no independent effect on the chemically induced aberrations. Figure 1; references 7: 5 Russian, 2 Western.  
[1060-2791]

## CYTOGENETIC EFFECT OF PROMETRIN ON CHROMOSOME APPARATUS OF CREPIS CAPILLARIS

Yerevan BIOLOGICHESKIY ZHURNAL ARMENII in Russian No 2, Feb 84  
(manuscript received 9 Apr 83) pp 93-96

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[Abstract] Study of mutagenic activity of the herbicide prometrin against the background of the mitotic cycle of *Cr. capillaris* is described and discussed. Types of chromosomal aberrations in  $G_1$ , S and  $G_2$  phases of the mitotic cycle and in *Cr. capillaris* rootlets after use of 0.1% and 0.05% concentrations of prometrin are tabulated and discussed. Prometrin in both concentrations is a delayed-action type mutagen. After use of both doses of prometrin, chromosome aberrations in phase  $G_1$  and S were at about the same level while they were approximately twice as high in the  $G_2$  phase. It was assumed that, in phases  $G_1$  and S, DNA and enzymes bound with it act more vigorously to normalize cell function and therefore the number of reconstructions here is less while, in  $G_2$  phase, when incorporation of precursors is reduced, the effect of interrelated DNA molecules and enzymes is inhibited by prometrin, thus impairing mechanisms of the reparation system and producing more chromosome reconstructions. References 15 (Russian).  
[1-60-2791]

UDC 576.8.095.313:38:576.8.851.155

DERANGEMENTS OF FIXED NITROGEN ASSIMILATION BY SOYA PLANTS IN SYMBIOSIS WITH RHIZOBIUM JAPONICUM ASP<sup>-</sup>

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84  
(manuscript received 11 Sep 83) pp 189-192

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[Abstract] Fixed nitrogen assimilation in soya plants was studied in relation to aspartate-aminotransferase (AAT) activity in symbiotic *Rhizobium japonicum* in the root nodules. Analysis of total nitrogen and protein in the leaves of the plants with uninoculated roots yielded values of 1.35% for N and 18.2% for protein. The corresponding values for plants inoculated with wild strain *Rh. japonicum* were 4.0 and 27.1%, and with *Rh. japonicum* asp<sup>-</sup> 1.9 and 20.9%. Enzymatic studies showed that both bacterial strains possessed normal levels of nitrogenase activity, but that AAT activity was lacking in the auxotrophic asp<sup>-</sup> mutant. Since the levels of total nitrogen

and protein in the nodules were quite high irrespective of the rhizobium strain used for inoculation, it appears that lack of AAT was responsible for diminished transport of fixed nitrogen from the nodules to the plant proper. The bacteria have thus been demonstrated to be involved in both the fixation of nomad nitrogen and in the active transport of fixed nitrogen to the plant. Figures 1; references 5: 1 Russian, 4 Western.  
[649-12172]

UDC 547.963.3

#### COMPARATIVE STUDIES ON DNA OF WINTER AND SPRING WHEAT FORMS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84  
(manuscript received 9 Sep 83) pp 218-221

LOBOV, V. P. and DASKALYUK, A. P., Institute of Plant Physiology,  
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[Abstract] Determinations were made of the reassociation kinetics of DNA derived from winter and spring forms of Artemovka, Mironovka 808 and Mironovka Spring wheats, and five lines of Triple Dirk wheat, to obtain comparative data and reveal possible differences. In addition, the putative effects of vernalization were studied by a similar investigation of the DNA derived from stem apex of Mironovka 808 subjected to vernalization. The findings showed that the spring and winter wheat varieties did not differ in terms of the organization of DNA nucleotide sequences. Furthermore, significant differential replication in the cells of the stem apex does not take place during vernalization. It thus appears that the differences between the winter and spring varieties are to be found in the regulation of gene expression. Figures 2; references 11: 5 Russian, 6 Western.  
[649-12172]

UDC 581.198

#### MACRO-, MICROELEMENTS AND ACCUMULATION OF QUINOLISIDINE ALKALOIDS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 276, No 1, May 84  
(manuscript received 19 Jan 84) pp 250-252

LOVKOVA, M. Ya., BUZUK, G. N. and KUZ'MICHEVA, N. A., Institute of  
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[Abstract] Formation and accumulation of alkaloids in the plants that produce them is a complex, dynamic process that is subject to both internal and external controlling factors, such as mineral nourishment. The present article reports on the effects of increasing doses of macro- and microelements

in *Lupinus polyphyllus* Lindl on alkaloid accumulation. Sprouts were grown in Petri dishes in filters soaked in distilled water or solutions of  $\text{MnCl}_2$ ,  $\text{FeSO}_4$ ,  $\text{CoCl}_2$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$ ,  $\text{H}_3\text{BO}_3$ ,  $\text{CuCl}_2$ ,  $\text{ZnCl}_2$  or  $\text{KCl}$  of varying concentrations. Alkaloids were separated from the sprouts by pulverization in ethanol. Results showed that the maximum increase in quinolizidine bases in the *L. polyphyllus* Lindl sprouts came with boron and chromium concentrations of  $10^{-6}$  M, manganese at  $10^{-5}$ , iron and copper at  $10^{-4}$  and zinc and potassium at  $10^{-3}$  M. Cobalt functioned as a means for reducing the content of alkaloids in the plants while increasing overall yields. Figures 2; references 9: 6 Russian, 3 Western.  
[645-12131]

UDC 547.963.3

#### FORMATION OF PARASEXUAL HYBRIDS BETWEEN *ARABIDOPSIS THALIANA* AND *BRASSICA CAMPESTRIS* RELATED TO DNA SIMILARITY

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 276, No 2, May 84  
(manuscript received 14 Dec 83) pp 489-493

MIROSHNICHENKO, G. P. and VOLKOV, R. A., Moscow State University  
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[Abstract] Significant successes in hybridization by protoplast fusion (parasexual or somatic hybridization) can be assessed objectively by genosystematic methods. The present article reports on organization of polynucleotide succession in *arabidopsis* and turnip genomes isolated from leaf lysates. After centrifugal purification, DNA fragments 300-400 and 1300-1500 nucleotides in length were prepared and analyzed. Experimental and theoretical curves were prepared that show reassociation of components separated in analyzing the DNA. In turnips, the most rapidly reassociating component of the DNA made up 7%, and in *arabidopsis* 33%, of the total in the genome. Polynucleotide succession was assessed by comparing short and long fragments; here results indicated that as length increased from the short to the long fragments, the share of rapidly reassociating components decreased in *arabidopsis* by a factor of 1.3 and in turnips by a factor of 1.6. The implications of these facts suggest that the genera *Arabidopsis* and *Brassica* are more closely related than previously supposed. Figures 2; references 15: 3 Russian, 12 Western.  
[644-12131]

COMPARISON OF FLOCCULATION METHODS OF IMMUNODIAGNOSIS OF PLANT VIRUSES

Moscow BIOKHIMIYA in Russian Vol 49, No 2, Feb 84  
(manuscript received 16 May 83) pp 272-274

BOYKOV, S. V., CHIRKOV, S. N., SURGUCHEVA, N. A. and ATABEKOV, I. G.,  
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[Abstract] The goal of this study was to compare two agglutination methods: agglutination of polystyrene latex particles presensitized with protein A (PALLAS-test) and virobacterial agglutination reaction (VBA-test) in determination of potatoe X-virus, potatoe Y-virus and carnation mottle virus in purified preparations and in the sap of infected plants. Experimental results showed that the sensitivity and specificity of both tests in determining above viruses were practically identical. The advantage of the PALLAS-test was in that the reagents could be stored for a long time, while those for the VBA-test had to be prepared fresh. Both tests were found to be superior to the drop and immunodiffusion tests. References 8: 3 Russian, 5 Western.  
[638-7813]

## BIOCHEMISTRY

### MECHANICAL INACTIVATION OF ENZYMES

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 29 Apr 83) pp 190-193

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[Abstract] Studies were conducted on the kinetic and thermodynamic parameters of enzyme inactivation by milling of powdered preparations of trypsin and subtilisin at 80-295°K. Employing low MW chromogenic substrates (p-nitroanilide and p-nitrophenyl derivatives of amino acids and peptides) revealed that inactivation of both enzymes can be described as a first-order reaction in the range where activity decreases ten- to twenty-fold. The inactivation parameters were identical under air and helium. The energy of activation of the inactivation process for trypsin was calculated at ca. 1250 kJ/mole, while determination of active sites showed that inactivation by milling involved loss of trypsin sites. Since inactivation was accompanied by a decrease in active site concentration and a decrease in  $k_{cat}$ , the data were interpreted to indicate that some of the enzyme molecules completely lost catalytic properties while others functioned less efficiently than the native enzyme. Figures 3; references 18: 14 Russian, 4 Western.  
[1511-12172]

UDC 577.11

### BIOSYNTHESIS OF GLYCOLIPOPROTEIDES OF PLASTID MEMBRANE SYSTEM DURING BIOGENESIS OF CHLOROPLASTS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 2, Mar 84  
(manuscript received 12 Oct 83) pp 493-497

KSENZENKO, S. M., SERGIYENKO, I. Z., TRUSOVA, V. M. and MOLCHANOV, M. I.,  
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[Abstract] The insertion of  $^3\text{H}$ -leucine into glycolipoproteids (GLP) purified of phosphatidyl glycerines and into residual membrane proteins during

biogenesis of chloroplasts was studied on 3-5 day sprouts of Bukovinskiy-3 corn and Russkiye chernyye faba beans. On the basis of the experimental results it was proposed that hydrophobic GLP of the lamellar system of chloroplasts, which are soluble in a neutral chloroform-methanol mixture (2:1) and which bind dicyclohexylcarbodiimide, are the first membrane proteins synthesized in vitro during incubation of chloroplasts with tagged aminoacids. Distribution of  $^3\text{H}$ -leucine radioactivity between the polar lipids and prolamellar and lamellar system of corn plastids showed that 26-52% of  $^3\text{H}$ -leucine was concentrated in aminoacylphosphatidylglycerine fractions of GLP. References 15: 13 Russian, 2 Western.  
[648-7813]

UDC 577.12

BENECKEA HARVEYI LUCIFERASE: BACTERIAL IRON ENZYME

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84  
(manuscript received 15 Sep 83) pp 206-209

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[Abstract] The activity of luciferase derived from *Beneckea* (*Vibrio*) *harveyi* was determined under different incubation conditions, including and excluding the addition of o-phenanthroline to chelate  $\text{Fe}^{++}$ . Analysis of the spectral data provided clear indication that *B. harveyi* luciferase is an iron enzyme as indicated by the inhibition of activity on addition of o-phenanthroline. Furthermore, the iron component exists in the ferrous ( $\text{Fe}^{++}$ ) state, as indicated by the absence of a colored complex when a reducing agent was not added. The nonheme iron appears to be located in the electron transport chain at some point outside the flavin binding site, since FMN addition was a prerequisite for  $\text{Fe}^{++}$ -o-phenanthroline complex formation. The demonstration that nonheme iron is required for *B. harveyi* luciferase function suggests that it may represent a multienzyme complex. Figures 2; references 15: 3 Russian, 12 Western.  
[649-12172]

## STREPTOVERTICILLIUM AMINOACYLASE: STEREO- AND SUBSTRATE SPECIFICITY

Moscow BIOKHIMIYA in Russian Vol 49, No 4, Apr 84  
(manuscript received 20 Apr 83) pp 547-550

SKVORTSOVA, Ye. Ye., GALAYEV, I. Yu., NYS, P. S., SHVYADAS, V. K. and SAVITSKAYA, Ye. M., All-Union Scientific Research Institute of Antibiotics, Moscow; Moscow State University imeni M. V. Lomonosov

[Abstract] Determinations were made of the properties of a novel aminoacylase isolated from Streptovercillium to assess its potential usefulness in the preparation of optically pure amino acid enantiomers. The aminoacylase in question was effective in hydrolysis of the acetylated derivatives of aliphatic (methionine, leucine) and aromatic (phenylglycine, phenylalanine, tryptophan) amino acids, showing somewhat greater affinity for the latter amino acids. The enzyme was equally effective in the soluble and immobilize forms. Tests with N-acetyl-D-phenylglycine and N-acetyl-L-phenylglycine showed that the Streptovercillium aminoacylase hydrolyzed the latter substrate with an efficiency that was 8000-fold greater than that seen with the D-enantiomer at pH 7.0, 40°C, and a substrate concentration of 0.04 M. It is evident that the aminoacylase under study possesses a wide spectrum of substrate activity and can be used to resolve racemic mixtures of amino acids into pure enantiomers. Figures 1; references 16: 6 Russian, 10 Western. [1500-12172]

UDC 577.158.54

## INHIBITION OF FIREFLY LUCIFERASE BY MIXED ANHYDRIDES OF ADENOSINE-5'-PHOSPHATES AND MESITYLENE CARBOXYLIC ACID

Moscow BIOKHIMIYA in Russian Vol 49, No 4, Apr 84  
(manuscript received 4 Jul 83) pp 585-589

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[Abstract] The kinetics of firefly (*Luciola mingrellica*) luciferase inhibition were investigated in a system employing mixed anhydrides of ATP, AMP, and ADP with mesitylene carboxylic acid (ATP-MC, ADP-MC, AMP-MC). The mixed anhydrides acted as reversible inhibitors of luciferase: with luciferin as a substrate these compounds behaved as noncompetitive inhibitors, with ADP-MC serving as the strongest inhibitor and ATP-MC as the weakest. With respect to ATP, ATP-MC behaved as a competitive inhibitor and the other mixed anhydrides as noncompetitive inhibitors. In the latter case ADP-MC also served as the most efficient inhibitor. These facts were interpreted to indicate that ATP-MC binds only to the ATP-substrate site of luciferase, while AMP-MC and ADP-MC bind to allosteric sites in analogy

to other ATP congeners. In addition, binding of a second AMP-MC molecule induced positive cooperativity in that the binding of a second AMP-MC molecule was facilitated. Figures 3; references 12: 9 Russian, 3 Western. [1500-12172]

UDC 577.152.3

SALIVARY LIPASE AND CHOLESTEROL ESTERASE ACTIVITIES OF MEDICINAL LEECH  
*HIRUDO MEDICINALIS*

Moscow BIOKHIMIYA in Russian Vol 49, No 4, Apr 84  
(manuscript received 27 Jul 83) pp 676-678

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[Abstract] Salivary secretions of the medicinal leech *Hirudo medicinalis* were investigated for lipase and cholesterol esterase activities to further elucidate the mechanisms responsible for the anticoagulant properties of leech saliva. Both activities were identified: the rate of hydrolysis of glycerol trioleate was  $8.2 \pm 0.3$  nmoles/h/mg protein with a  $K_m$  of  $3.6 \times 10^{-6}$  M, while that of cholesterol oleate was  $3.1 \pm 0.2$  nmoles/h/mg protein with a  $K_m$  of  $5.1 \times 10^{-6}$  M. In addition, sodium cholate inhibited cholesterol esterase activity by 60% in 0.24 M tris-HCl buffer, pH 8.0, at 37°C. Figures 2; references 10: 6 Russian, 4 Western. [1500-12172]

UDC 577.153

G-PROTEINS OF BOVINE RETINAL PHOTORECEPTORS: PURIFICATION AND ANTIBODY  
INDUCTION

Moscow BIOKHIMIYA in Russian Vol 49, No 4, Apr 84  
(manuscript received 1 Aug 83) pp 679-685

KALININA, S. N. and ETINGOF, R. N., Institute of Evolutionary Physiology and Biochemistry imeni I. M. Sechenov, USSR Academy of Medical Sciences, Leningrad

[Abstract] Description is provided for the immunization of rabbits with G-proteins derived from bovine retinal photoreceptors to facilitate immunochemical comparison with G-proteins derived from other species, and to determine the effects of such antibodies on phosphodiesterase activation by guanylyl-5'-yl-imidodiphosphate and NaF. Double radial immunodiffusion demonstrated cross-reaction of antibodies directed against the bovine GTP-binding proteins (i.e., G-proteins) with those derived from pigs and frogs

(*Rana temporaria*). Immunoelectrophoresis confirmed the reaction of the antibodies with the G-proteins with the outer rod segments, and that complex-formation between the antibodies and the G-proteins prevented activation of cyclic nucleotides phosphodiesterase in illuminated retinal membranes and their extracts by nonhydrolyzable effectors (guanylyl-5'-yl-imidophosphate and NaF). The antibodies failed to yield precipitation lines with G-protein on immunodiffusion tests, which would suggest that the antibodies did not belong to the IgG class. Figures 4; references 16: 7 Russian, 9 Western. [1500-12172]

UDC 547.963.3

EXTRACTING VARIATIONS OF CORE HISTONES FROM NUCLEI AFTER MILD HYDROLYSIS  
BY DNA-ASE I

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 276, No 2, May 84  
(manuscript received 19 Nov 83) pp 498-500

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USSR Academy of Sciences, Moscow

[Abstract] Processing of Eucariot nuclei with DNA-ase I under mild conditions has been shown to affect transcription-active chromatin, violating their super-spiral structure. The present article reports on investigations of this breakdown using intact nuclei of mouse spleens hydrolyzed with 5-10% NaCl, leading to release of all core histones. All operations were conducted under refrigeration with a protease inhibitor. Results showed that the extracted histones represented a specific hyperacetyl fraction. Results gave further confirmation to the hypothesis that histone H1 is less common to the NaCl fraction released by such mild hydrolysis than is expected among core histones. This was previously shown to be the case with the histone's absence in transcription-active chromatin segments. References 14: 2 Russian, 12 Western. [644-12131]

UDC 577.15

MULTIPLE MOLECULAR FORMS OF GRASS APHID ESTERASES (SCHIZAPHIS GRAMINA):  
INHIBITORY IDENTIFICATION AND STEREOSPECIFICITY

Moscow BIOKHIMIYA in Russian Vol 48, No 10, Oct 83  
(manuscript received 14 Dec 82) pp 1634-1642

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[Abstract] Using the method of disk electrophoresis in polyacrylamide gel, the spectrum of molecular forms of cholinesterases and non-specific esterases

of Schizaphis gramina aphids were studied along with inhibitory action of the following agents on these aphids: organophosphorus insecticides (OPI), phosphoric monothioesters containing carbomethoxy group  $C_8H_{17}O(CH_3)P(O)SCH_2-SCH_2COOCH_3$  (I), aminoacid radicals,  $\beta$ -alanine,  $(C_2H_5O)_2P(O)SCH_2CONHCH_2CH_2COOC_2H_5$  (II),  $C_2H_5O(CH_3)P^*(O)SCH_2CONHCH_2CH_2COOC_2H_5$  (III), and valine (IV). Previous studies showed that derivatives of the  $\beta$ -alanine act selectively against aphids and those of valine--against ticks. Nine esterase fractions were identified; the slower fractions (1-4) were cholinesterases and the faster fractions (5-7) were carboxylesterases. The fastest fractions (8-9) which were resistant to inhibitors were identified as arylesterases. The thiophosphonate I was found to inhibit aphid carboxylesterase. The  $\beta$ -alanine derivatives II and III were more selective towards both acetylcholinesterase and carboxylesterase than the valine derivative IV. Investigation of the effect of asymmetry centers of OPI showed that asymmetry at the phosphorus atom was more essential to the specific activity than asymmetry at the carbon atom. No significant differences of the isolated fraction were found in their sensitivity towards OPI. Figures 4; references 26: 17 Russian (1 by Western author), 9 Western. [1502-7813]

UDC 547.963.32 + 577.157.6

#### ABILITY OF E. COLI DNA-METHYLASES TO MODIFY DENATURED DNA

Moscow BIOKHIMIYA in Russian Vol 48, No 10, Oct 83  
(manuscript received 1 Mar 83) pp 1752-1754

BUR'YANOV, Ya. I., KHOLODKOV, O. A., BOGDARINA, I. G., NESTERENKO, V. F., ZAKHARCHENKO, V. N. and CHERNOV, A. P., Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino, Moscow Oblast

[Abstract] The goal of this study was to evaluate the ability of purified E. coli DNA methylases with established site specificity to modify single-strand DNA. The following methylases were studied: cystine DNA-methylases EcoRII, EcoMRE 600 dcmI, Eco MRE 600 dcmII, adenine DNA methylase Eco dam and the methylase Hpa II. Experimental data showed that all the enzymes studied were capable of modifying denatured single-strand DNA. The ability of bacterial DNA-methylases of secondary type to modify single-strand substrates may be used to insert a radioactive tag into denatured, non-reassociated DNA's. References 15: 5 Russian, 10 Western. [1502-7813]

## ISOLATION AND PROPERTIES OF NEUROSPECIFIC PROTEINS 14-3-2, 14-3-3 AND 10-40-4

Moscow BIOKHIMIYA in Russian Vol 49, No 3, Mar 84  
(manuscript received 15 Jul 83) pp 355-360

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[Abstract] Isolation of neurospecific proteins 14-3, 10-40-4 and 14-3-3 from human brain and study of some of their properties are described and discussed. The isolation procedures include fractionation by ammonium sulfate at 40-60 percent saturation, ion-exchange chromatography on DEAE-cellulose, gel-filtration through Sephadex G-150 and ion exchange chromatography on DEAE-Sephadex A-50. This method of isolation of neurospecific protein is superior to the method employing affine chromatography. Mono-specific antisera to the protein were produced and used to demonstrate the neurospecificity of these antigens and to study their species specificity. Some physico-chemical properties of the isolated proteins are studied and discussed. Individual neurospecific protein 14-3-2 possessing enolase activity was isolated, its relative thermostability is shown and a mono-specific antiserum for it is produced. Figures 6; references 14: 1 Russian, 13 Western.  
[1505-2791]

UDC 577.352.315

## INCORPORATION OF Na,K-ATP-ase INTO HUMAN ERYTHROCYTE MEMBRANES BY LIPOSOMES

Moscow BIOKHIMIYA in Russian Vol 49, No 3, Mar 84  
(manuscript received 15 Jun 83) pp 460-463

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Physiology imeni A. A. Bogomolets, UkSSR Academy of Sciences, Kiev

[Abstract] Replantation of bovine Na, K-ATPase from artificial membranes by fusion of proteoliposomes and human erythrocytes is described. Determination of Na K-ATPase activity in modified liposomes showed that proteoliposome-treated human erythrocytes have higher exo-ATPase activity than that seen in control preparations. A system of active transport of cows realized ATP-dependent transport of  $^{22}\text{Na}$  into erythrocytes and  $^{86}\text{Rb}$  from the erythrocytes. Addition of ATP to erythrocytes, modified by liposomes, does not increase  $^{22}\text{Na}$  transport into the erythrocytes and  $^{86}\text{Rb}$  transport from the cells. Addition of strophanthine to the erythrocytes inhibited  $^{86}\text{Rb}$  transport from the cells. Figures 2; references 12: 2 Russian, 10 Western.  
[1505-2791]

## BIOPHYSICS

### MECHANISM OF PIEZOELECTRIC POLARIZATION OF COLLAGEN

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 24 Jun 83) pp 212-215

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[Abstract] Previous studies on piezoelectric effects in collagen [Chepel' et al., MEKHANIKA POLIMEROV, No 4: 702, 1978] were continued to elucidate structural features responsible for, or contributory to, piezoelectric polarization of collagen. The magnitude of piezocoefficients in collagen is such as to indicate that the piezoeffect is predicated on reorientation of existing dipoles in collagen, rather than on deformation-induced changes in dipole moments of atoms or bonds. The mathematical analysis of piezoelectric polarization is consonant with the presence of repeated sequences in the collagen coil of gly-pro-hydroxy- in each of the three peptide chains. The triplets contain two mobile dipoles: a four-atom peptide bond between glycine and proline, and  $\alpha C_1-H$  dipole. The dipole moment of the latter is negligible, and all calculations of polarization effects are based on the former. Calculation of the  $e_{14}$  piezocoefficient as  $2.9 \times 10^{-3}$  K/m<sup>2</sup> for the collagen films under study represents a geometry in which shearstress in plane YZ induces polarization along the X axis. Figures 3; references 15: 6 Russian, 9 Western.  
[1511-12172]

UDC 577.37

### ELECTROOSMOSIS AT CONTACT SITES IN BILAYER LIPID MEMBRANES

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 3 Feb 83) pp 220-222

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[Abstract] Measurements were made of the effects of application of a potential difference to the outer surface of two bilayer lipid membranes

(BLM) on the steady-state distance between the two BLMs maintained in parallel contact. Application of voltage resulted in separation of the membranes to an extent proportional to the applied potential. The size of the resultant cleft was ascribed to electroosmotic inflow of liquid due to the fact that the applied charge altered the negatively charged outer membrane surface and the  $K^+$  cloud overlying it. Depending on the polarity of the applied potential,  $K^+$  either enters or leaves the intermembranous space, and the ionic flux is responsible for the movement of water with the ions, a phenomenon designated as electroosmotic transport. These observations indicate that the effects of an external current on contact between BLMs are mediated by electroosmotic mechanisms. Figures 2; references 7: 4 Russian, 3 Western. [1511-12172]

#### EFFECTS OF GLYCEROL ON CAPACITANCE AND CONDUCTANCE OF BILAYER LIPID MEMBRANES

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 31 Dec 82) pp 223-226

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[Abstract] Lecithin/cholesterol bilayer lipid membranes (BLM) were used in studies designed to elucidate the mechanism of action of the cryoprotectant glycerol on cell membranes. Addition of glycerol to both sides of the BLM had no effect on membrane capacitance, while addition of the alcohol to one surface reduced capacitance in a linear, dose-related fashion. Glycerol wash-out, or addition of glycerol to the other surface, abrogated the effect. Glycerol was also found to increase the conductivity of membranes that had a starting specific conductance greater than  $2 \times 10^{-7} \text{ ohm}^{-1} \cdot \text{cm}^{-2}$ , eventually resulting in fluctuations in conductance with a frequency of 2 Hz. Such a 'stressful' state ends with membrane rupture after 20-30 min. These observed effects of glycerol were ascribed to its demonstrated capacity for inducing structural rearrangements in the membrane lipids. Figures 3; references 9: 8 Russian, 1 Western. [1511-12172]

## ANIONIC CHANNELS IN PLASMA MEMBRANE OF PHOTORECEPTOR CELLS

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 22 Sep 82) pp 237-240

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[Abstract] The patch clamp technique was utilized in electrophysiological studies on *Rana temporaria* retinal rods to detect and enumerate anionic channels in the plasma membrane. The microelectrode studies yielded a channel concentration of approximately 0.1 per  $\mu\text{m}^2$  for the external and internal segments, with the exception of the apical portion where the channel density was less by an order of magnitude. The conductance of the fully open channels was calculated at  $200 \pm 30 \text{ p}\Omega$  in 0.1 M NaCl. Studies on ionic selectivity based on the inside-out patch clamp approach yielded the following relative permeabilities for  $\text{Cl}^-:\text{F}^-:\text{NO}_3^-:\text{C}_3\text{H}_5\text{O}_2^- = 1:0.60:0.32:<0.05$ . Functional  $\text{Na}^+$  channels were not detected, but this may have been due to masking by the highly permeable  $\text{Cl}^-$  channels. Figures 2; references 12 (Western).

[1511-12172]

## CRITERIA FOR INCORPORATION OF BACTERIORHODOPSIN INTO BILAYER LIPID MEMBRANES

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 17 Dec 82) pp 246-249

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[Abstract] A theoretical analysis was conducted on the contribution of bacteriorhodopsin adsorbed on, and incorporated into, bilayer lipid membranes (BLM) to light and dark photocurrents. Incorporation can be achieved by employing  $\text{Ca}^{++}$  to promote fusion between BLM and bacteriorhodopsin-carrying proteoliposomes. Proceeding from the equation proposed by Herrmann and Rayfield [BIOPHYS. J., 21: 11, 1978] for treating liposomal membranes with incorporated bacteriorhodopsin molecules as a battery with parallel elements generating EMF, it was shown that the effects of an applied voltage on the initial and stationary photocurrent, in conjunction with the effects of oxidative phosphorylation uncouplers on the dependence of the stationary photocurrent on dark conductivity, can be used to differentiate between the photoresponse of adsorbed and incorporated bacteriorhodopsin. In situations in which bacteriorhodopsin is incorporated into BLM, the initial photocurrent, in response to illumination, does not differ from the stationary photocurrent, and disappears on exclusion of light without transitional processes, whereas such processes are present when bacteriorhodopsin is adsorbed to the BLM. When both adsorbed and incorporated bacteriorhodopsin is present, the photocurrents from these two populations are summed up. Figures 1; references 8: 1 Russian, 7 Western.

[1511-12172]

# INCORPORATION OF BACTERIORHODOPSIN PROTEOLIPOSOMES INTO BILAYER LIPID MEMBRANES

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 30 Dec 82) pp 250-254

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[Abstract] Determinations were made of the photoelectric activity of bilayer lipid membranes (BLM), prepared from phosphatidylserine and phosphatidylcholine, following fusion with bacteriorhodopsin liposomes derived from *Halobacterium halobium*. The study utilized previously delineated criteria for the differentiation of photocurrents due to adsorbed and incorporated bacteriorhodopsin [Mirskiy, VM & Sokolov, VS, BIOFIZIKA, 29: 246, 1984] for the assessment of the latter. Evaluation of the results obtained with the application of external voltage, and the effects of membrane conductivity in the presence and absence of uncouplers of oxidative phosphorylation on stationary photocurrents, indicated that 60-90% of the stationary photocurrent in the absence of the uncoupling agent was due to BLM-incorporated bacteriorhodopsin. Under the conditions employed, approximately  $10^9$  liposomes/m<sup>2</sup> were incorporated into the BLM, and about  $2.5 \times 10^{10}$ /m<sup>2</sup> were adsorbed. Figures 3; references 8: 1 Russian, 7 Western.  
[1511-12172]

# LECITHIN LIPOSOMES: EFFECTS OF CRYOPROTECTORS ON STRUCTURAL TRANSFORMATIONS AND STABILITY OF AGGREGATE STATE

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 19 Nov 82) pp 259-263

ZIMOGLYAD, B. N., VASIL'CHENKO, V. N., VASIL'CHENKO, N. S.,  
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[Abstract] Light scattering and electron microscopy were employed in assessing the effects of low MW cryoprotectors on structural transformations and stability of the aggregate state of lecithin liposomes. The anisotropic scattering data for preparations in 10% glucose:glycerol (1:1) mixture, 10% glycerol, and 20% glycerol indicated that such cryoprotective systems induced essentially identical redistributions of the liposomes in terms of size, mass, and surface densities, and that subsequent storage at 78°K had virtually no effect on large-scale structural parameters. The cryoprotectors were found effective in maintaining both the concentration and the size and mass of the small liposomes, i.e., in increasing the stability of their structural characteristics and of their aggregate state. The

hydrosols remained stable for over a month, and even after 50 days half of the liposomes had not undergone degradation. Figures 4; references 8: 4 Russian, 4 Western.  
[1511-12172]

#### NMR RELAXATION STUDY ON ERYTHROCYTE PERMEABILITY AND DAMAGE AT $-1^{\circ}$ TO $-9^{\circ}\text{C}$

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 11 Feb 83) pp 264-267

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[Abstract] NMR relaxation technique was utilized in studies on intracellular and extracellular uncrystallized water in human erythrocytes subjected to temperatures ranging from  $-1^{\circ}$  to  $-9^{\circ}\text{C}$ , by resuspending the cells in 5 mM  $\text{MnCl}_2$ . Progressive compression of the red cells during freezing to a temperature of  $-5^{\circ}\text{C}$  corresponded to an increase in solvent osmolality and followed the criteria of an ideal osmometer without, however, alteration of membrane permeability to water. Lowering the temperature to  $-7^{\circ}\text{C}$  altered the permeability of the membrane to  $\text{Mn}^{++}$  in about 25% of the cells as they approached minimum volume due to compression. At  $-9^{\circ}\text{C}$  100% of the cells were damaged. Thawing from  $-7^{\circ}\text{C}$  was accompanied by membrane damage when the temperature rose by  $1-2^{\circ}\text{C}$ , i.e., the erythrocyte membranes are damaged during the early stages of thawing. Analysis of water molecule lifetime values in the cells during freezing and thawing from the  $-2^{\circ}$  to  $-4^{\circ}\text{C}$  level indicated that, despite marked membrane deformation, ice formation, and increased osmolality of the medium, permeability of the membrane to water was little affected. Figures 3; references 10 (Western).  
[1511-12172]

#### NMR STUDY ON LOW TEMPERATURE CRYSTALLIZATION IN E. COLI CELLS

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 14 Feb 83) pp 268-271

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[Abstract] NMR and electron microscopy were used in studies on freezing, then thawing, of E. coli cells to follow the fate of water during the cryopreservation process. The degree of dehydration was found to correlate with the freezing time. In the  $0^{\circ}$  to  $-20^{\circ}\text{C}$  range extracellular water was frozen, while intracellular water showed ice formation in the  $-20^{\circ}$  to  $-65^{\circ}\text{C}$  range; 'firmly-bound' intracellular water was not fully frozen even at  $-90^{\circ}\text{C}$ . Consequently, the temperature of  $-65^{\circ}\text{C}$  appears to correspond to the threshold

temperature of intracellular crystallization. The most profound ultra-structural changes in the cells occurred when they were frozen at the rate of 10°C/min. Evaluation of rapid (1°C/min) and slow (30°C/min) thawing data and correlation with freezing parameters demonstrated that at a given temperature the quantity of unfrozen water in the cells is greater during thawing than during freezing. Figures 3; references 9: 5 Russian, 4 Western.  
[1511-12172]

DOPAMINE MODULATION OF Ca COMPONENT OF NEURONAL ACTION POTENTIAL IN  
L. STAGNALIS MOLLUSKS

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 27 Jan 83) pp 284-288

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[Abstract] Voltage clamp and intracellular dialysis methodology were employed in studies on the controlling mechanisms of the calcium component of neuronal action potentials in the minor and greater parietal ganglia of the mollusk *L. stagnalis*. Using a sodium-free medium and blockage of potassium currents, addition of dopamine (1  $\mu$ M) inhibited Ca-dependent current and diminished the maximum voltage of the action potentials by 30-35%. The dopamine-induced effects on the Ca currents were reversible, and similar effects were obtained with serotonin and epinephrine. Experiments with enzyme activators and inhibitors demonstrated that the effects of these neuromediators were not predicated on the levels of neural cAMP or ionized calcium. Figures 3; references 15: 3 Russian, 12 Western.  
[1511-12172]

EFFECTS OF SERIAL, LOW AMPLITUDE MAGNETIC FIELD PULSES ON ELECTRICAL  
ACTIVITY OF MOLLUSCAN NEURONS

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 28 Jan 83; in final form 18 Apr 83) pp 320-321

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[Abstract] Electrophysiological studies were conducted on the neurons of *Limnaea stagnalis* to determine whether the effects of low amplitude magnetic field pulses can be summated. Exposure of 15 neurons to 0.1 mT field ( $10^{-2}$  mT/sec wavefront, 0.1 mT/sec receding front) showed that a single pulse was without effect, but that a series of pulses at 15 sec

intervals altered electrical activity of 14 of the neurons. Furthermore, neurons exhibiting spontaneous background activity presented with an increase in discharge frequency, while neurons lacking such activity showed either an increase or a decrease in the resting membrane potential. Studies with an interpulse of 60 sec yielded similar results. These observations indicate that the effects of individual pulses are subject to summation, insofar as the electrical activity of *L. stagnalis* neurons is concerned. Figures 1; references 2 (Russian).  
[1511-12172]

#### COUPLING OF PHOTOCHEMICAL AND DARK CYCLIC REACTIONS IN PHOTOSYNTHESIS

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 10 Jun 83) pp 340-342

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[Abstract] Proceeding from the fact that photosynthesis with one limiting photoreaction can be described by an unbranched series of cyclic reactions, involving reversible transformation at the active site, electron carriers, enzymes, etc., a mathematical equation was derived for the overall rate of the process under stationary conditions and constant light intensity. An analogous argument was advanced to account for a system with branching polycyclic reactions. The system was then expanded to accommodate a second photochemical reaction with the derivation of a corresponding equation.  
[1511-12172]

#### ESR STUDY OF MITOCHONDRIA AT LOW TEMPERATURES

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 15 Jun 83) pp 342-343

NARDID, O. A., ZAGNOYKO, V. I., MOISEYEV, V. A. and LUGOVOY, V. I., Institute of Cryobiological and Cryomedical Problems, Ukrainian SSR Academy of Sciences, Kharkov

[Abstract] The state of (rat?) mitochondria on freezing and thawing was investigated by the ESR method [Gavrilova, II, et al., CRYOLETTERS, 2:197, 1981]. Analysis of the ESR spectra for indications of water crystallization and determination of  $Ni^{++}$  permeability showed that on freezing the intermitochondrial matrix undergoes dehydration, along with membrane thickening. Such defects as do occur in the membrane do not alter permeability for  $Ni^{++}$ . On thawing, reversal of the observed changes was noted, along with an influx of  $Ni^{++}$  into the mitochondria. The enhanced permeability for  $Ni^{++}$  may be due either to sudden rehydration and swelling,

or functional manifestation of defects formed earlier as a result of the appearance of the liquid phase of water. Figures 1; references 8: 4 Russian, 4 Western.  
[1511-12172]

UDC 577.3:577.23

MODEL SYSTEM STUDIES ON MEMBRANE POTENTIAL GENERATION KINETICS  
BY ACTIVE SITES ON RHODOPSEUDOMONAS SPHAEROIDES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84  
(manuscript received 18 Nov 83) pp 193-198

DRACHEV, L. A., ZAKHAROVA, N. I., KARAGULYAN, A. K., KONDRASHIN, A. A.  
and SEMENOV, A. Yu., Moscow State University imeni M. V. Lomonosov;  
People's Friendship University imeni Patrice Lumumba, Moscow

[Abstract] Measurements were made of the generation and drop kinetics of differences in electrical potential ( $\Delta\psi$ ) of a model system, involving Rhodopseudomonas sphaeroides chromatophores incorporated into proteoliposome-collodion membrane systems. Evaluation of the  $\Delta\psi$  values following exposure to 530 nm laser pulses and the effects of redox mediators and inhibitors of electron transfer indicated that the generation and drop of  $\Delta\psi$  was due largely to formation and discharge of the primary  $P870^+ \cdot Q_a^-$  dipole. Addition of redox mediators (phenazinemethosulfate, vitamin K<sub>3</sub>, ascorbate) leads to transfer of electrons from  $Q_a^-$  to secondary acceptors and appearance of transmembrane  $\Delta\psi$ . Under such conditions drop kinetics are determined both by the discharge of the primary dipole and passive discharge of the transmembrane  $\Delta\psi$ . The kinetic parameters mimic those observed with native chromatophores and underline the utility of this model system. Figures 3; references 14: 3 Russian, 11 Western.  
[649-12172]

UDC 577.3

"ORDERED COAGULATION" OF LONG SPIRAL MOLECULES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84  
(manuscript received 2 Sep 83) pp 201-205

NAMIOT, V. A., Scientific Research Institute of Nuclear Physics, Moscow  
State University imeni M. V. Lomonosov

[Abstract] Mathematical analysis was performed on electrostatic factors that may lead to association of macromolecules resulting in the formation of a globular complex, as well as to associations predicated on distortions in the medium leading to similar end results. The macromolecules under

consideration were construed to be long fibrillar molecules possessing spiral or helical symmetry in parallel to each other. The calculations demonstrated that interactions between the helical molecules, such as DNA, are such that attractive forces between them are sufficient only in situations if their periodicities coincide, the axes are parallel to one another, the distances between the axes are smaller than the periodicity of the helices, and the angles of rotation are fixed relative to one another. References 10: 9 Russian, 1 Western.  
[649-12172]

UDC 577.152.1

## TWO ENZYME NADH:FMN-OXIDOREDUCTASE-LUCIFERASE SYSTEM OF LUMINESCENT BACTERIA

Moscow BIOKHIMIYA in Russian Vol 49, No 4, Apr 84  
(manuscript received 17 Aug 83) pp 692-702

PETUSHKOV, V. N., KRATASYUK, G. A., RODIONOVA, N. S., FISH, A. M. and BELOBROV, P. I., Institute of Biophysics, Siberian Department, USSR Academy of Sciences, Krasnoyarsk; Institute of Physics imeni L. V. Kirenskiy, Siberian Department, USSR Academy of Sciences, Krasnoyarsk

[Abstract] A mathematical and experimental analysis was conducted on two NADH:FMN-oxidoreductase-luciferase systems in the luminescent bacteria *Beneckea harveyi* and *Photobacterium leiognathi*. The two-enzyme system consists of an initial reductase-mediated reduction of FMN to FMNH<sub>2</sub> (FMN + NADH + H<sup>+</sup> → FMNH<sub>2</sub> + NAD<sup>+</sup>), which is coupled to subsequent oxidation of FMNH<sub>2</sub> and conversion of aldehyde to acid by luciferase with light production (FMNH<sub>2</sub> + RCHO + O<sub>2</sub> → FMN + RCOOH + H<sub>2</sub>O + hν). The reactions were shown to be coupled via the free FMNH<sub>2</sub> on the basis of in vitro data, indicating that a multienzyme reductase/luciferase complex is not formed. Since the two enzyme system transforms changes in NADH concentration into quanta of light, an analytic system was designed that permits detection of low concentrations of NADH with a sensitivity of 10<sup>-16</sup> moles. Figures 8; references 24: 6 Russian, 18 Western.  
[1500-12172]

## BIOTECHNOLOGY

### BRIEF

BIOTECHNOLOGY CONFERENCE IN KAZAKHSTAN--(KazTAG)--Instead of long years of time-consuming breeding work, rapid development of new cultivars by giving them needed properties is the potential benefit of biotechnology in agriculture. The problems of this new scientific-technical branch were discussed at the All-Union Conference on "Current Problems of Biotechnology," which started on 23 May in Alma-Ata, with the participation of about 200 scientists and specialists from Moscow, Leningrad and other cities. N. S. Yegorov, deputy USSR minister of higher and secondary specialized education, who delivered the opening remarks, K. N. Naribayev, Kazakh minister of higher and secondary specialized education and other speakers discussed the achievements of physicochemical biology and gene engineering, this new branch of science is finding increasing applications in the national economy and medicine. Kazakhstan scientists are also making a significant contribution to this. [Text] [Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 24 May 84 p 4] 10,657

CSO: 1840/637

## BIOLOGICAL MICRODEVICES

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 3, Mar 84 pp 118-128

IVANITSKIY, G. R., corresponding member, USSR Academy of Sciences

[Abstract] Miniaturization, increased sensitivity and lower production costs are the main tendencies of the technology of this century. The literature on biological microdevices grows by leaps and bounds: they are used at an increasing rate in various processes as detecting and executing elements. There are many reasons for this increased interest in biological devices: biological materials are cheap and their sources are practically limitless; they can transform many types of energies; coefficient of their effectiveness is very high and they can be used in a wide number of applications. Work on initiation of biosystems through synthetic products is being expanded. Thanks to advances in molecular biophysics, bioconvertors may now be produced with specific properties, selectivity and sensitivity. In this paper, application of biotechnology is discussed in the area of detectors, memory devices and calculators. Even though microtechnology based on biological materials is in its infancy, in another decade it could play a leading role in many technological processes. Figures 5; references 11: 7 Russian, 4 Western (2 by Russian authors).  
[639-7813]

ISOLATION AND PURIFICATION OF TWO EXTRACELLULAR ACYLASES FROM ACTINOMYCETE OF THE STREPTOVERTICILLIUM STRAIN

Moscow BIOKHIMIYA in Russian Vol 49, No 3, Mar 84  
(manuscript received 29 Jul 83) pp 519-526

BORISOV, I. L., MARKARYAN, A. N., ORESHINA, M. G., PENZIKOVA, G. A., GALAYEV, I. Yu., BARTOSHEVICH, Yu. E. and SHVYADAS, V. K., Laboratory of Molecular Biology and Bioorganic Chemistry imeni A. N. Belozerskiy, Moscow State University imeni M. V. Lomonosov, Moscow; All-Union Scientific Research Institute of Antibiotics, Moscow

[Abstract] Production of acylases and study of their basic physico-chemical characteristics were carried out with use of extracellular cultural fluid of actinomycete strain 62 (*Streptoverticillium* sp.). The strain produces two extracellular acylases, penicillin-V acylase and aminoacylase, simultaneously. These acylases are similar in physico-chemical properties but differ considerably in thermostability and substrate specificity. Aminoacylase is more thermostable. Both enzymes are glucoproteins. Carbohydrate content is 5 percent by mass for penicillinacylase. Both have similar molecular weights, sedimentation coefficient, electrophoretic mobilities, electrophoretic mobility and both have an isoelectric point in the alkaline region of pH. Penicillinacylase specifically hydrolyzes phenoxymethylpenicillin and aminoacylase hydrolyzes N-acetyl derivatives of L-amino acids. Neither enzyme is metal dependent. Figures 4; references 22: 8 Russian, 14 Western. [1505-2791]

UDC 597.08:591.1(262.5)

RELATIONSHIP BETWEEN GENERATIVE AND SOMATIC PRODUCTION OF BLACK SEA FISH

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 5, Apr 84  
(manuscript received 29 Dec 83) pp 1511-1513

SHUL'MAN, G. Ye. and URDENKO, S. Yu., Institute of Biology of the Southern Seas, UkSSR Academy of Sciences, Sevastopol'

[Abstract] Quantitative relationship between generative and somatic production of multi-batch spawning fish was determined on the following representatives: *Engraulis encrasicolus ponticus* Aleksandrov, *Mullus barbatus ponticus* Essipov, *Sprattus sprattus phalericus*, *Odontogadus merlangus euxinus* and *Spicara flexuosa* Pusanov. The data showed that generative production of these Black Sea fish was 20-60% of their total production. It would appear that specific weight of generative processes was inversely proportional to the surrounding water temperature. Except for the sprats, the generative production was below the somatic production. References 12 (Russian).  
[646-7813]

ENVIRONMENT

UDC 581.526.325:581.132.(262 + 262.5)

LUMINESCENT PICOSESTON (0.2-2.0 mkm) IN OLIGOTROPHIC WATERS OF  
MEDITERRANEAN AND BLACK SEAS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 6, Apr 84  
(manuscript received 21 Oct 83) pp 1514-1516

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Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast

[Abstract] Using a microspectrofluorometer MSF-1, the composition of the  
luminescent particles of the picoplankton of Mediterranean and Black Seas  
was studied, the material for this work being collected during the June-  
July cruise. Three groups of luminescent particles were registered: green,  
red and orange, their respective sizes being 0.3, 0.5 and 1.5 x 0.8 mcm. The  
green particles were related to detritus, the red contained chlorophyll and  
the orange ones belonged to cyanobacteria. Vertical distribution of pico-  
seston was clearly stratified. The data showed abundance of photosynthesiz-  
ing picoplankton in the lower part of the euphotic zone of oligotrophic  
waters in Mediterranean and Black Seas with some specific, not yet quite  
clear, role in these ecosystems. Figures 2; references 5: 2 Russian,  
3 Western.  
[646-7813]

## FOOD TECHNOLOGY

### LIANOZOVSKIY PLANT SUPPLIES MILK FOR ALL MOSCOW INFANTS

Moscow VECHERNYAYA MOSKVA in Russian 18 Jun 84 p 1

[Article by L. Napreyenko, "Newcomer to Capital Industry"]

[Text] Scarcely a year and a half at most has passed, and it is already taking care of the entire capital's nursing-age babies. The Lianozovskiy Experimental Plant for Pediatric Nutrition supplies the milk kitchens of Moscow with sterilized, vitaminized milk and infant yogurt.

As of the fourth quarter, mothers and fathers will also obtain infant cottage cheese, and "Malyutka" acidophilus and milk mixes at multiple distribution centers. At present they are being prepared by rayon milk kitchens, whose capacities cannot of course be compared in any way with the automated plant.

Finishing off the technological process for manufacturing cottage cheese and the mixtures is drawing to a close; the process is automated, and the degree to which the procedure is adhered to is controlled electronically.

It is this, the latest technology equipping the enterprise, that has determined the age composition of the collective. Young people work here, for the most part.

One of the chief points among socialist commitments adopted by the collective in the very first days of the enterprise's operation was to adopt the brigade form of labor organization. Twelve brigades out of the fourteen that were planned have already been created--integrated and flow-line, since milk products are manufactured according to a two-shift closed cycle.

Representatives of all basic shops and auxiliary services are on the staff of each brigade. What distinguishes these collectives, besides their universality?

"It is primarily the healthy moral climate: comradely mutual support, high responsibility, intolerance for lack of discipline...", says the plant's chief engineer, A. Orlov.

The processing shop is the heart of the plant. Here the milk is received, its microbiological and chemical indicators are checked, and it is prepared

for processing. The milk is also sterilized here and yogurt is prepared. Also, when the product line is expanded, the "Malyutka" mixture will also come from the processing shop.

A distinct rhythm and strict adherence to plan discipline often puts the control room in prize-winning positions. The uncompromising high standards by which comrades evaluate each member of the brigade plays no small role in this.

The brigade council discussion of the labor participation coefficient for May can serve as an example of this. It would seem that all 22 members of the collective work with an equal amount of effort. However, the council found it necessary to change the data that had been originally presented for nine of them: the coefficient was raised for five of them and lowered for four.

"And this is natural," believes shop chief L. Kompanets. "Indeed there are also the best of the best, who serve as an example both in labor and in relations with people. For example, in this category we have instrument control man V. Bereznyuk, fitter-repairman N. Kuznetsov, senior mechanic V. Lyuboyev..."

It must be stated that the level of indicators for the whole plant collective is quite high. Monthly quotas and socialist commitments for aboveplant increase in labor productivity by one percent are being fulfilled at an outstripping rate.

Today, the Lianozovskiy Plant is processing up to 100 tons of milk per day. When its output reaches planned capacity, this number will increase significantly.

12262

CSO: 1840/662

#### BRIEF

NEW FEED SUPPLEMENT--A new exhibit was opened in the "Protection of the USSR Environment" pavillion at the Exhibition of Achievements of the National Economy of the USSR. The exhibitor is the Institute of Zoology and Physiology, Moldavian Academy of Sciences which, together with the Bendery Biochemical Plant of the Moldavgidrolizprom [Moldavian Hydrolysis Industry] Production Association, developed the industrial technology for recovery of dry corn gluten from liquid waste from starch and molasses production. The new product is not toxic and contains absolutely no pathogenic microorganisms. There is drastic increase in livestock productivity when the corn gluten is added to the diet. For example, there was an increase by more than 100 grams in mean daily weight gain of young calves, while mean daily milk yield from lactating cows increased by 1 kilogram. Introduction to industry of the method developed by Moldavian scientists and production workers will make it possible to produce up to 5000 tons of high-protein and biologically valuable feed supplement, and at the same time to prevent pollution of this republic's water resources. [By V. Ryndin] [Text] [Kishinev SOVETSKAYA MOLDAVIYA in Russian 9 May 84 p 2] 10,657

CSO: 1840/637

## GENETICS

### CEMA COOPERATION IN GENETIC MICROBIOLOGICAL ENGINEERING

Moscow KOMSOMOL'SKAYA PRAVDA in Russian 13 Jun 84 p 3

[Article by L. Repin, Stary Boleslav-Prague: "Hunt for the Elusive"]

[Text] The Council for Mutual Economic Assistance was founded 35 years ago this year. In connection with this memorable date, the editors of the newspapers KOMSOMOL'SKAYA PRAVDA, MLADA FRONTA (Czechoslovakia), JUNGLE WELT (GDR), and NARODNA MLADEZH (Bulgaria) decided to undertake a joint effort to publicize cooperation between these countries in the field of biology.

"Can you imagine how dangerous it would be to have living creatures which did not exist in nature but which unexpectedly were synthesized artificially?", probingly asked Dr. František Kapralek, Chief of the Genetic Engineering Laboratory at the Czechoslovak Academy of Sciences Institute of Molecular Genetics.

I immediately pictured the form of an ant-like monster the size of a dog. But if it were only just a dog. If such a creature were to grow proportionally to adult size, it could move faster than a smooth-running Zhiguli car and would turn out to be many times stronger than an elephant, and could bite through a age-old tree trunk in a single movement of its jaws. No, such a creature we do not need.

Dr. Kapralek understood my doubts about the advisability of creating such creatures, although they wouldn't necessarily have to be like a monster ant, and he added assuringly:

"When the first studies in genetic engineering appeared there were many people who said that this would be an extremely dangerous activity because the emergence of microorganisms that did not exist in nature might lead to dangerous, even irreversible consequences. Now, after a prolonged period of time during which considerable experience in genetic engineering has been gained, one can say, although such fears were natural, they are without foundation. We have learned to work in a way that guarantees complete reliability and safety."

Dr. Kapralek then led me through the rooms of a unique laboratory, the only one of its kind in Czechoslovakia, and told me that one of the most important activities here is the very delicate work being done in separating enzymes from the virus of a malignant tumor in farm-bred poultry. This enzyme is somehow the raw material for further work in the search for new ways to control malignant diseases in poultry. And if scientists today did not have as precise an instrument as genetic engineering, which makes it possible to make amazingly highly refined manipulations in microorganisms, they could hardly count on making any progress in this area.

Candidate of Biological Sciences Irži Zadina opened a massive door in front of us which looked like a bank vault, then opened another door and we found ourselves in the main section of the laboratory where microorganism experiments are conducted. It was here that I understood why Dr. Kapralek spoke with such confidence about the guaranteed reliability and environmental safety of these experiments.

In the first place, the instruments are thoroughly sterilized in autoclaves. In the second place, the atmospheric pressure in this room is purposefully somewhat below normal so that the microorganisms cannot penetrate into the neighboring rooms where the pressure is higher. In the third place, a complex network of special filters is set up along the path of the used up air and water that prevents even the most slippery microbes from passing through. There are so many all-encompassing precautions that must be taken to achieve the greatest possible purity in experimentation. The only thing that needs to be added is that a group of Czechoslovak and Soviet scientists received the USSR State Prize for their work in this field which helps in probing the mechanism that reveals certain gene functions and characteristics, and for achieving definite advances in understanding the hidden causes behind the sudden growth of a recently heretofore healthy cell and its abrupt transformation into a malignant one.

The laboratory is cozily located in a pine forest, far from inhabited areas. Somehow one recalls Irži Zadina saying that, as a rule, he doesn't see this beauty. One time he returned home and his wife was glad that her husband had spent such a lovely, sunny day in the pine forest, but he listened and was surprised. He didn't know that that day had been particularly special.

It seemed to me that both František Kapralek and Irži Zadina were alike in many ways. Particularly in that they both prefer to work in solitude. They love their quiet, secluded laboratory where nothing distracts them from their favorite work and nothing interferes with their concentration. That is because their work demands maximum concentration and attentiveness. This is highly refined work.

A little later, Dr. Zdenek Goštalek, the director of the Czechoslovak Academy of Sciences Institute of Microbiology, told us at the Institute about just such refined experiments for the purpose of synthetically producing new microorganisms that are capable of carrying out work needed by man. Manifested in this endeavor is one of the new trends in present-day science. Although that direction was non-existent before, many generations of

prominent scientists and alchemists of the Middle Ages worked indefatigably, firmly convinced of their ultimate success, but worked in vain in the same direction: They were trying to create new substances with previously assigned properties. The evolvement of genetic engineering has allowed biologists to reach a new, high, previously inaccessible height--the production of microorganisms with previously assigned properties.

"In the Department of Molecular Biology and Genetics," said Dr. Gošťalek, "in connection with the decision adopted, genetic engineering methods are being applied to ongoing intensive projects concerned with new techniques and the search for economically useful microorganisms. The principle of this undertaking has been worked out and has already yielded the desired results on a number of occasions, i.e., a portion of the genetic material in one microorganism is transferred from that organism to another which consequently makes it possible to produce substances that do not occur in nature." Of course, all of this is accomplished under the elaborate sterile conditions that were demonstrated to me in Dr. František Kaprál's laboratory.

Well, for example, well-known microorganisms very efficiently fix nitrogen from air, but reproduce slowly and grow at an insufficient rate. On the other hand, others grow splendidly. Theoretically, the task is rather simple. In practice, this narrows down to the necessity of isolating from rapidly-growing bacteria the gene that is responsible for growth and then transplanting it to nitrogen-fixing bacteria. This results in the production of other bacteria that are essential to production. Dr. Zdenek Gošťalek also told us that a number of other research directions are being successfully worked out at the Institute at the specific requests of industrial workers.

For example, citric acid, which is essential in the production of many food products and a number of sterile powders, was produced from mold fungi that grow on sugar. Understandably, this was very expensive. A new process was developed at the Institute for producing this acid with the aid of bacteria cultivated in special fermenters. The process is automatically operated and has already been introduced into production.

Another problem being worked on at the Institute is the development of non-waste processes for utilizing substances that were previously ejected into the air, released into the sewer system through which they entered rivers and reservoirs. This problem arose when industrial enterprises were faced with the problem of environmental conservation. It then became necessary to think about whether all of these waste products might be useful and serve as a nutritive medium for some kind of industrial microorganisms. One of these substances that pollute water was the alkaline sulfides that are disposed of as waste products in the production of cellulose from wood. A method for utilizing such alkali for producing forage protein was recently worked out at the Institute of Microbiology. It turned out that there is a species of bacteria that actively grow on this substance and that form yeasts that can be added as protein to cattle feed concentrate.

"We worked out the entire book of the process," said Dr. Gošťalek. "The first plant to utilize our process is already under construction. One of our

priority tasks is to produce pure nutrient protein. Incidentally, in this area we have been working together with Soviet colleagues."

I came to hear a lot at this institute about cooperation with Soviet scientists and specialists. In fact, many fundamental studies are being conducted here in cooperation with our specialists from the USSR Academy of Sciences Institute for the Biochemistry and Physiology of Microorganisms. In one of the laboratories we talked with one associate from that institute, Lyudmila Trislenko, who has been working here in Czechoslovakia for several months. In their turn, Czechoslovak scientists from the Institute of Microbiology can be found in laboratories in Pushchino where the Institute for the Biochemistry and Physiology of Microorganisms is located.

Later, together with Engineer Miroslav Sobotka who is also going to work in Moscow, we went past numerous laboratories of the Institute and past a sign on one of the doors that sounds very funny in Russian: "Pozor! Kislik!". That was in the shop in which large experimental fermenters are located. I already know what "pozor" means in Czech. It means "Attention!", and "kislik" turns out to be "acid". Taken altogether, this reminded me of a prank played by school children on a comrade nicknamed Kislik. Miroslav smiled after listening to the Russian version of that very serious sign and opened the door to the shop.

He proudly showed me impressive equipment on which complex microbiological processes are being developed and which will be transferred from this very room to plant shops. He said that the process is automatically controlled with the aid of large computers. The project is going on to completion.

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## GENETIC ENGINEERING ADVANCES

Kiev RABOCHAYA GAZETA in Russian 5 Jun 84 p 4

[Interview with Yuriy Yur'yevich Gleba, doctor of biological sciences and chief of the Cytophysiology and Cellular Engineering Department of the Ukrainian Academy of Sciences Botany Institute imeni N. G. Kholodniy, by A. Fandeyev at the Botany Institute in Kiev; date not specified]

[Text] One experiences nervousness mixed with curiosity in the Cytophysiology and Cellular Engineering Department of the Ukrainian Academy of Sciences Botany Institute imeni N. G. Kholodniy. Behind the door with the plate "Cultivation Room" there is a great deal of summer-like heat and light, and on glass shelves miniature sprouts are turning green in the transparency of flasks and test tubes. New plants are being grown here, the like of which have not yet existed on earth, and most astonishing of all, they are generated from a cell.

In unique operations chambers continuously supplied with sterile air, cells of tissues of various plants are freed from the rigid cellulose-pectin membrane. Special enzymes serve as a scalpel in this process. "Naked" cells, protoplasts are obtained. Additives promoting their fusion are introduced to the enzyme solution. Thus, hybrid protoplast comes into being. By operating with microinstruments, they locate it under the microscope and transfer it to a nutrient medium. In the course of several weeks, the newborn protoplast synthesizes a new membrane. The cell-hybrid is now "dressed" and subsequently acquires the capacity to divide, to form cellular colonies, and even to give life to plants.

Fandeyev: Why was it necessary to "engineer" so many unusual plants?

Gleba: Among those miniature sprouts in the Cultivation Room you saw hybrids of a wild potato with a cultivated one, says the chief of the Cytophysiology and Cellular Engineering Department, Doctor of Biological Sciences Yuriy Yur'yevich Gleba. In them we try to combine valuable traits of both species: the resistance to herbicides and low temperatures of one and the food value and yield of the other. We conduct the work jointly with the Potato Institute of the Ukrainian Ministry of Agriculture.

Fandeyev: Yuriy Yur'yevich, what are the advantages of the cell hybridization method over standard hybridization?

Gleba: The new method opens hitherto unknown opportunities to geneticists and breeders. By combining two or more cells, it is possible to achieve the richest hybrid heredity, and to reduce the long selection process many times over. In fact, until now it took 10-15 years to produce a new variety. Moreover, it is possible to manipulate genes and cells of very different organisms.

As early as 1978 we created a hybrid, the only one of its kind, of the genetically remote arabidopsis and turnip plants. It then became clear that remote hybridization is completely practicable.

Fandeyev: In speaking of genetic engineering, we are essentially speaking of the wonderful world of the cell...

Gleba: The cell is actually an entire world, in which there are approximately a hundred million genes. We have a rather clear representation of the organization of two or three dozen of them, but this is no cause for discouragement. It is far more important to learn to handle the most complex biochemical vehicle of the cell: to look into its nature, to explain the basic principles of the processes taking place within it.

Fandeyev: Yuriy Yur'yevich, in one of your books I read about the "plant-animal" cellular model. Can such a thing be possible?

Gleba: We were also able to obtain "plant-animal" hybrids in 1978. They can only survive for two to three days at the most. But in these few days, with the help of electron microscopy and microchemistry, we are able to observe what goes on with cell membranes and nuclei, which mechanisms inhibit their coexistence, what is the reason for genotype incompatibility, how they are organized and how they behave. Before our eyes an incredibly interesting "performance" is being played, and even though the heroes die at the end, it is probable that their death brings us closer to a solution to the secrets of life.

Fandeyev: Couldn't you just dream a little and glance some 20-30 years into the future of cellular engineering?

Gleba: Dreams, as everyone knows, are always based on actual facts. And the facts are these: ninety percent of all food is of plant origin, and ninety-five percent of man's nutritional plants are from dozens of basic plants: wheat, rye, rice, potatoes... Having taken this "arithmetic" into consideration, it is already possible to dream about most unique plants, created by scientists "by order", with predetermined properties. However, the method of cellular engineering is so powerful and radical and indeed the science itself is so young, that it is almost hopeless to predict what will be happening in 10 years.

Fandeyev: I noticed that the staff members of the department that you head are also young...

Gleba: The average age of the group is 26-27 years. There are nine graduate students, five candidates and two doctors of sciences. Biophysicists, geneticists, physiologists, virologists, and even a retrained zoologist-- people for whom, without exaggeration, science and life are inseparable concepts. The department has been in existence for two years in all. Until then it was a laboratory. It was organized by K. M. Sytnik, vice president of the UkSSR Academy of Sciences and director of the Botany Institute imeni N. G. Kholodniy. He believed in the fact that these studies were a promising endeavor. Now our department is the first in the country, one of the leading centers in the world. A cycle of studies on the cellular and genetic engineering of higher plants is represented in the competition for the USSR State Prize in the area of science and technology.

12262

CSO: 1840/662

## PROGRESS IN BIOLOGICAL SCIENCES

Moscow PRAVDA in Russian 19 Jun 84 p 3

[Article by Yu. Ovchinnikov, academician and vice president of the USSR Academy of Sciences: "Secrets of Living Matter"]

[Text] Biology today is unusually rich in outstanding discoveries that are not only revolutionizing ideas about living matter but are also having a direct influence on successes of medicine, agriculture and many sectors of industry. Biotechnology can now be included among the main directions for scientific and technical progress.

The talk of biology and of present and future biotechnology is acquiring particular meaning on the eve of the opening of large world-wide scientific forums such as the conference of the Federation of European Biochemical Societies and the international symposium "Perspectives of Bio-organic Chemistry and Molecular Biology." More than 3,000 scientists from the USSR and many other countries will take part in their work. In the course of 10 days, Moscow and Alma-Ata will be centers of attraction for the biochemists of the planet.

How is this attractive area of knowledge getting along these days? Perhaps the most outstanding events are taking place in the sphere of physical and chemical biology, including various aspects of the study of the living cell, its components and biochemical mechanisms.

It seems that it was not so long ago that the principles of the structure of the basic hereditary substance, the famous double spiral of DNA [deoxyribonucleic acid] were decoded, and scientists have already learned to remake DNA at their own discretion and to manipulate its main elements, the genes, thus obtaining artificial or, as they are wont to say, recombinant genetic molecules. It was precisely based on the methods of genetic engineering that the contemporary branch of biochemistry arose, being designated "DNA industry." Microorganisms are still the main objects of genetic engineering, but real preconditions have already been outlined for a similar approach in the plant world, and the first attempts have been made to intervene in the less familiar hereditary apparatus of animals.

What are the goals? Naturally, for fundamental science the goal is the most effective study of the hereditary apparatus, its structures and functions, and enormous progress has been made in this area. From a practical point of view, the goal is to create totally different microorganisms (e.g., producers of antibiotics or fodder protein) with record productivity. In horticulture, the goal is to obtain fundamentally new hybrids with high yield and maximum resistance to unfavorable environmental factors. In the future, similar tasks will be solved in animal husbandry. It is claimed, and not without justification, that in this way it will be possible to take on the hereditary diseases of man.

Experiments in genetic engineering are uncommonly complicated. Nevertheless, however, the pace of the work in this area is increasing vigorously. For example, from the cells of the human body it was possible to separate genes responsible for the biosynthesis of the most important regulating proteins--hemoglobin, insulin, interferon and others. These genes were then implanted in the DNA of rapidly growing microorganisms, and in this way it proved possible to obtain bioregulators of the human body that were previously completely inaccessible. These substances are the medicine of a new era, they are natural for man and at the same time they represent universal means in fighting viral diseases, diabetes, blood diseases, etc.

In this way, in particular, the first industrial batches of human interferon were recently obtained in the USSR and work is being completed to introduce into practice the results of analogous developments for insulin and growth hormones. Through the method of recombined DNA, another microorganism has been obtained in our country, a super-producer of the very important essential amino acid threonine.

Successes in perception of the mechanisms of cell regulation have brought about the appearance and rapid development of a new science, cell biology. The wide use of cultures of plant and animal cells in practice led to the formation of cell technology, an important link in contemporary biotechnology.

Based on fundamental developments, the world's largest industry for the microbiological synthesis of protein for agriculture was created in the USSR. Broad-based experiments in growing plant cells have begun in the world's leading laboratories. In the USSR in particular, biomasses of ginseng and other medicinal plants are obtained by this means. Cell technology is widely used to create intervariety hybrids not obtained through conventional means (hybrid of a potato with a tomato, for example). The biotechnology of plant cells is one of the main spheres for the practical utilization of the achievements of biology.

In regard to animal cells, the greatest breakthrough here occurred in the area of immunology. This was in explaining the structure and function of protective proteins--immunoglobulins, in understanding the nature of tissue incompatibility and in the detailed study of lymphocytes and the most important regulators of the immune system. The largest echo resulted from the use of the methods of cell technology to obtain special hybrid cells that produce the so-called monoclonal antibodies. This greatly increased the possibilities for diagnosis and control in chemistry, biology and medicine.

Experimentation with animal cells is ever bolder in penetrating agricultural practice as well. In this connection, I will mention the outstanding research of Soviet scientists in the genetics and regulation of the sex of the mulberry silk worm, which led to a significant increase in the production of silk in our country. The methods of cell technology are finding ever more determined application in breeding work. It is enough to note the artificial fertilization of animals, the transplantation of zygotes, the obtaining of embryos and their transplantation.

The impetuous march of biotechnology seems to have pushed into the shadows many traditional directions of physical and chemical biology. But this impression is deceiving. Let us take, for example, the study of the structure and functions of the main material carriers of vital activity, the biopolymers, and also the various bioregulators--the hormones, vitamins, antibiotics and prostaglandins. There have been a number of successes here. The number of decoded proteins has long since exceeded 1,000, and the spacial structure of more than 150 of them has been ascertained. Just recently in the USSR, the primary structure was determined for several dozen proteins, including the largest among them, the DNA-dependent, RNA-polymerase (this enzyme directly carries out the parallel arrangement of the DNA genetic information). Ascertained was the structure of the most important enzymes participating in an azotic exchange. Even greater successes were achieved in analyzing the sequence of nucleotides in nucleic acids, especially in DNA. The time is not far off when scientists will be able to decode completely the structure of an entire genome of one of the simplest microorganisms, reading, in a manner of speaking, its entire genealogy.

One must not fail to mention the chemical synthesis of biologically important compounds. Science now has the ability to synthesize such structurally extremely complicated bioregulators as penicillin, tetracycline, vitamin B<sub>12</sub>, prostaglandins, chlorophyll, etc. Even more progress is being made in the synthesis of biopolymers. The complete synthesis of the genes of insulin and human interferon was recently performed in the USSR. The practical significance of this work is very great.

To a considerable degree, progress in the field of biochemistry, molecular biology, biophysics and bioorganic chemistry has been the result of the rapid assimilation of various physical and physical-chemical methods. Many original developments in this area belong to Soviet scientists, even though the industrial production of the corresponding instruments has not yet been perfected.

To understand cell processes and their control, it is essential to know in detail the structural and functional characteristics of the most important cell systems, in particular the cell membranes. It is precisely there where the systems of cell bioenergetics and their regulating apparatus are located. In this connection, I will mention the photosynthetic complex in the plant cell, which permits the plant to synthesize complex organic compounds from carbon dioxide and water through solar energy.

Much has been done by scientists of our country in clarifying the mechanism of photosynthesis and its mastery promises a true revolution in the natural

sciences. Also concentrated in the cell membranes are fermentation systems that process the basic fuel of the cell, adenosine triphosphoric acid (ATP). By the way, it was precisely in the USSR where the key role of ATP in muscle work was first demonstrated, and this research is considered classic. As a whole, the Soviet school of biomembranology has made a worthy contribution to this field, having cleared up the mechanism of membrane transport in plants and the role of the calcium transport system in the work of nerve cells, having decoded the working mechanism of membrane carriers-ionophores, having revealed the principle of membrane (wall) digestion, and having learned the structure and properties of principal membrane proteins such as visual rhodopsin and bacteriorhodopsin.

Thus the study of living matter has indeed entered a new era. But this still affects only very simple life systems. For the microbe cell differs from a human cell significantly more than a hoe does from a tractor.

To show the complexity of the problems that are still to be solved, I will touch on a few topical questions of medicine and practical experience. On the study of cancer, for example. There are obvious successes here. But what is the cause of cancer, what is its nature? In search of an answer to that question, the genetic or viral-genetic mechanisms of malignant degeneration have been revealed and the participating genetic elements--oncogenes and oncoproteins--have been characterized. But science has still not been able to free mankind from cancer. There is no doubt that the problem will be solved, but to do that scientists must still investigate in detail the normal growth processes and the differentiation of cells and tissues, and they must provide for a rapid assimilation of the methods and approaches of physical-chemical biology.

Or let us take cardiovascular diseases. There have been a number of achievements in studying these diseases. In recent years in particular, it was possible to take a giant step forward in understanding the mechanisms of the development of atherosclerosis and in proposing means of treating atherosclerosis through the directed transport of medicine. Our country's scientists are taking leading positions in this work, and the research is developing intensively along a broad front.

I will touch upon some questions having to do with the treatment of diseases of the nervous system. The mechanism of nerve conductivity and the functioning of the nerve cells of individual brain systems are at the center of attention of physical-chemical biology. The recently-discovered brain neuro-peptides, which are responsible for such important manifestations of nerve activity as sleep, pain and memory, are being studied broadly and successfully. Soviet neurophysiology has also achieved outstanding success.

There are many problems in physical-chemical biology and biotechnology whose solution is important for agriculture. Above all this concerns the incorporation of up-to-date approaches and methods in the genetic selection process (analysis of proteins, genes, etc.), research on the mechanisms involved in the action of growth substances, hormones, pesticides and other regulators, a determination of the concrete mechanisms for the action of

reagents linked with the use of biological methods of pest control, and a clarification of the genetic and molecular bases for binding atmospheric nitrogen by microorganisms. Immobilized enzymes should be more widely utilized in the production of food products.

In one article, of course, it is not possible to deal with all problems, but what has been mentioned provides some idea of the nature and urgency of the subject of the upcoming forums. In essence, these are largely global problems of human health, food and environmental protection. The interest in these meetings is therefore understandable, as is their importance for science and mankind.

In our country, serious attention is being paid to the development of the latest orientations of biological science and to the wide incorporation of the achievements of biotechnology in the national economy. Ten years ago, the CPSU Central Committee and the USSR Council of Ministers adopted a resolution on measures to accelerate the development of molecular biology and molecular genetics and to utilize achievements there in the national economy, a resolution determining the rapid rate of development of these sciences. Institutes were consolidated and established in Moscow, Leningrad, Novosibirsk, Vladivostok and in virtually all Union republics. Personnel training was improved and the material base of research was strengthened. New impetus was given to the cause in 1981 with the resolution of the CPSU Central Committee and the USSR Council of Ministers on the further development of physical-chemical biology and biotechnology and on utilizing their achievements in medicine, agriculture and industry. The significance of this sphere of science for the national economy and the increased well-being of our people and Soviet public health was noted many times by Comrade K. U. Chernenko, general secretary of the CPSU Central Committee and chairman of the USSR Supreme Soviet Presidium, who is the initiator of the accelerated development of scientific and scientific-technical studies in this field and who provides constant support and help to this orientation. Many scientific centers of this nature with world-wide fame are successfully working in the USSR. Programs have been established in physical-chemical biology and biotechnology. Problems are gradually being solved in the more precise organization of the programs, in putting the results of concluded studies into practice, in increasing the production of domestic equipment and reagents for biological research, and in the construction of institutes and experimental installations.

International meetings of scientists are accelerating scientific and technical progress and are contributing to the rapid utilization of advanced ideas. Soviet scientists are actively developing cooperation with leading foreign centers and support ties with scientists from various countries. Biology is particularly exemplary in this regard. World and European forums in the new directions are regularly held in the USSR and there is an exchange of specialists.

The noble ideas of international scientific cooperation are supported by scientists throughout the world. Pitiful and unconvincing in this

connection are the various voices, especially in the United States, that are trying to poison the atmosphere of trust and mutual understanding, that fabricate all sorts of insinuations about the situation in Soviet biology and try to belittle the importance of the work carried out by Soviet biologists. It is difficult to say what is truly behind these false statements, an impotent rage because of the successes of Soviet biological science or simple ignorance. The world scientific community and USSR scientists are not allowing themselves to be dragged into the next spiral of the "cold war." They are remaining loyal to the ideals of cooperation, are continuing to work on problems that correspond to the very essence of biology and its humane aspirations, and they will continue to make a worthy contribution to progress and mutual understanding between nations.

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CSO: 1840/672

### BRIEFS

GENETICS CONFERENCE OPENS--Kiev (RATAU) 16 April--Important questions concerning the nature of hereditary diseases, their propagation, and medical and genetic principles of prevention and treatment are being discussed at the All-Union Conference of Medical Geneticists that opened today in the capital of the Ukraine. Leading Soviet scientists and their colleagues from Bulgaria, Hungary, the GDR, Poland, Czechoslovakia, Yugoslavia as well as from Norway and the FRG are participating in its work. Noted researchers from the PRC, as well as England, India, Canada, the United States, and Japan are guests of the conference. They will participate in the conference on certain special problems of genetics, being held under the aegis of the World Health Organization. During the opening of the conference, greetings from WHO were announced to participants. Participating in the work of the congress are M. A. Orlik, chairman of the UkSSR Council of Ministers, O. P. Shchepin, first deputy minister of the USSR Ministry of Health, A. Ye. Romanenko, minister, UkSSR Ministry of Health, and responsible officials of the Ukrainian Communist Party Central Committee. [Text] [Kiev PRAVDA UKRAINY in Russian 17 April 84 p 3 (11)] 12262

GENETICS CONFERENCE DISCUSSES PROBLEMS--Kiev (TASS) 16 [APR]--The health of a person can be predicted even before his birth--so specialists in the field of medical genetics affirm today. The early diagnosis and treatment of certain hereditary diseases and the discovery in newborns of hidden metabolic disorders are now dependent on the representatives of this young, rapidly developing science. Agents effective against hereditary anomalies are being developed with persistence. The 1st All-Union Conference of Medical Geneticists, which opened today in the capital of the Ukraine, is dedicated to these and many other problems dealt with by more than 200 of the country's scientific and practical health institutions. Along with Soviet scientists, their colleagues from a number of foreign countries are participating in its work. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 Apr 84 p 3 (11)] 12262

UKSSR GENETIC SYMPOSIUM HELD--Kanev, Cherkassy Oblast (RATAU) 24 May--It would take approximately 10 years for a breeder to transfer the valuable traits of one variety of agricultural crops to another, but in the experimental sections of the UkSSR Academy of Sciences Molecular Biology and Genetics Institute, this period has been shortened to a year. Genetic "plans" help engineers and designers of living matter to perfect such truly astonishing transformations. By using these, the hereditary apparatus of plants can be restructured, transmitting to renewable crops new properties which can be consolidated even in subsequent generations. Having become the true science of the century, along with successes in the diagnosis and treatment of hereditary diseases and the increased variety and improved quality of products of the microbiology industry, today genetics also provides for the development of high-yield varieties that are resistant to many diseases, drought, and frost, and the development of highly productive animal species. Results of studies in this area were discussed at the republic symposium, "Biochemical Mechanisms for Regulating Genetic Activity", held today in Kanev. The studies of leading republic scientists, as well as those of their colleagues from Moscow, Leningrad, Novosibirsk and other cities were presented here. [Text] [Kiev PRAVDA UKRAINY in Russian 25 May 84 p 3 (11)] 12262

GENETIC CONTROL OF PROCESSES OF DNA REPARATION, RECOMBINATION AND  
MUTAGENESIS IN EUCARYOTIC MICROORGANISMS

Moscow DOKLADY MOIP 1981. OBSHCAYA BIOLOGIYA, NEKOTORYYE ASPEKTY  
ISSLEDOVANIYA BIOLOGICHESKIKH SISTEM in Russian 1983  
(signed to press 29 Dec 82) pp 19-22

KAMENEVA, S. V.

[Abstract] Analysis of genetic control of DNA reparation processes in eucaryotic microorganisms, involving the study of mycelial fungus, Ascomycetes *Aspergillus nidulans* and yeast *Saccharomyces cerevisiae*, was described and discussed. Study of *Aspergillus* was used to develop general concepts concerning reparation systems in mycelial fungi and their connection with recombination and mutagenesis. Study of yeast was performed to obtain a more detailed picture of genetic control and molecular mechanisms of the process of reparation of 2-strand breaks of DNA (DNR, DNA). Study of uvs-mutants of *Aspergillus* provided some ideas about genetic control of reparation processes in this fungus, their participation in mutagenesis and the close connection with recombination events. Genes controlling individual branches of these processes were identified. An experimental system, based on the study of DNR and DNA reparation processes during holding of x-irradiated yeast cells in a non-nutrient medium, showed that restoration of x-irradiated diploid yeast cells after holding in the non-nutrient medium is caused by DNR and DNA reparation which requires the presence in the nucleus of 2 copies of the genetic material.  
[1060-2791]

REGULATION OF QUANTITY OF RIBOSOME DNA IN DROSOPHILA MELANOGASTER.  
RETROCOMPENSATION OF RDNA IN LINES OF TRINUCLEOLIC FEMALES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 3, Mar 84  
(manuscript received 14 Nov 83) pp 754-758

BASHKIROV, V. N., KUBANEYSHVILI, M. Sh., YALAKAS, M. E., KARPOV, I. A.  
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[Abstract] Fruit fly rDNA genes are localized in nucleolic organizers (NO) of X- and Y-chromosomes in roughly equal distribution. Since the consequences of more than two nucleolic organizers on a diploid genome for rDNA remains unclear, the authors studied lines with 3 nucleolic organizers in females of *D. melanogaster*. In all cases, rDNA content for the 3-NO lines was reduced in comparison with those with a single NO. They next synthesized a line in which all males with double Y-chromosomes were lethal, thus assuring more accurate determination of rDNA. With these parameters, widely differing amounts of rDNA were observed in succeeding generations. Thus retrocompensation of rDNA appears to be reversible, but only gradually, in the course of 3-4 generations. The number of generations required depended on differences in the females produced by reciprocal cross-breeding. Hyperreplication and hyporeplication are discussed hypothetically.

References 10 (Western).

[647-12131]

DIFFERENT RELATIVE GENETIC EFFECTIVENESS OF INTERMEDIATE NEUTRONS  
( $E_{ave}=0.35$  MeV) FROM GENE AND STRUCTURAL MUTATIONS DURING IRRADIATION OF  
DROSOPHILA SPERM

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 2, Mar 84  
(manuscript received 18 Nov 83) pp 483-486

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[Abstract] Comparative analysis of relative genetic effectiveness (RGE) of neutrons with average energy of 0.1, 0.35 and 0.85 MeV on mature sperm of *D. melanogaster* was carried out to test whether the intermediate neutrons (0.3-0.4 MeV) are more effective in induction of genetic mutations than the neutrons of other energy levels. Analysis of the dose-effect data showed that indeed the 0.35 MeV neutrons were more effective in causing visible aberrational mutations and recessive sex-linked lethals than the 0.1 and 0.85 MeV neutrons; the induction of gene mutations by these neutrons was unexpectedly low (1.47%). Thus, instead of the expected parallel effect,

an almost opposite situation was found in the formation of gene and chromosome mutations indicating a strong causal relationship between the qualitative characteristics of primary damage to mature sperms of drosophila. Figures 1; references 12: 7 Russian, 5 Western.  
[648-7813]

UDC 575.114.4

#### CLONING OF HIGHER PLANT DNA IN BACILLUS SUBTILIS CELLS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 272, No 2, Mar 84  
(manuscript received 3 Nov 83) pp 486-489

BASHKIROV, V. I., GLUMOVA, Ye. F., POLUEKTOVA, Ye. U., IRICH, V. Yu. and PROZOROV, A. A., Institute of General Genetics, USSR Academy of Sciences, Moscow

[Abstract] An attempt was made to clone wheat DNA in Bac. subtilis cells and to elucidate the cloning characteristics of higher plant DNA in microorganisms other than E. coli. It was shown that, in principle, Bac. subtilis is a suitable system for cloning DNA of higher organisms. However, cloned DNA fragments were rather small, smaller than average size of the fragments of cloned DNA immediately post restriction. The yield of transformants per unit DNA was also low, probably because the copying ability and stability of hybrid plasmids in these cells was inversely proportional to the size of plasmid. Also, during plasmid transformation by Bac. subtilis, only the multimeric plasmid forms were active, while the predominant portion of the native and restricted-ligated molecules appeared to be monomeric. Figures 2; references 9: 2 Russian, 7 Western.  
[648-7813]

UDC 612.112.94:612.014.24:612.014.482

#### HETEROGENEITY OF CHROMOSOMAL RADIOSENSITIVITY IN PHA-STIMULATED HUMAN LYMPHOCYTES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84  
(manuscript received 27 Sep 83) pp 182-185

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[Abstract] Radiosensitivity of PHA-stimulated human lymphocytes was studied with respect to chromosomal abnormalities induced by intermediate and fast neutrons, for comparison with sensitivity patterns shown after gamma-irradiation. Prior to cultivation in the presence of PHA for 50 h, G<sub>0</sub> phase leukocytes were exposed to intermediate (0.35 MeV, 0.021-3.4 Gy)

or fast (0.85 MeV, 0.022-5.0 Gy) neutrons or  $^{60}\text{Co}$  gamma-irradiation (0.05-10 Gy). The formation of aberrant cells differed markedly for the neutron- and gamma-irradiated leukocytes, with the former showing a markedly greater slope. While 100% aberrant cell formation was obtained with gamma-irradiation at the higher doses, irradiation with fast and intermediate neutrons failed to reach the 100% level. In fact, at the higher doses the percentage of aberrant cells began to decrease after a maximum of ca. 90%. Peak aberrant cell formation was reached sooner with the intermediate neutrons than with the fast neutrons. Plots of total cells vs. number of aberrations/cell showed a normal Poisson distribution for the gamma-irradiated cells, but were skewed to the left for the neutron-exposed cells. The PHA-stimulated leukocytes were thus demonstrated to constitute a heterogeneous population with regards to susceptibility to neutron-induced chromosomal damage. Figures 3; references 13: 3 Russian, 10 Western.  
[649-12172]

UDC 577.12

RINGED DNA CORRESPONDING TO MOBILE DISPERSED GENES IN DROSOPHILA  
MELANOGASTER CELL CULTURE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 276, No 1, May 84  
(manuscript received 24 Nov 83) pp 246-249

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[Abstract] A significant share of *D. melanogaster* genomes is found on mobile dispersed genes (MDG). There are numerous common features between MDG and retrovirus proviruses, and to clarify their relationship, the authors studied the formation of ringed extrachromosomal MDG copies using the 67J25D and  $\text{Kc}_0$  lines. The Hirt method with modifications was used to isolate ringed DNA, which was placed in  $^3\text{H}$ -thymidine, then precipitated using alcohol and separated by electrophoresis in agar gel. To determine whether only ringed DNA was obtained, or copies were also present, the DNA was treated with restrictases HindIII and HincII and then hybridized with  $^{32}\text{P}$ -DNA of the copia gene. It was determined that the 67J25D line contained both copia genes and variants bearing a deletion, while the  $\text{Kc}_0$  line contained only copies of ringed DNA MDG3 with a deletion of 1.3 tpn [thousand pairs of nucleotides] dimension. Thus, results showed that, similar to animal retroviruses, mobile dispersed genes of *D. melanogaster* appear in the composition of extrachromosomal super-spiral ringed DNA. The fruit fly cell culture of the  $\text{Kc}_0$  also showed amplification of MDG3 copies containing a 1.3 tpn deletion. Figures 1; references 15: 2 Russian, 13 Western.  
[645-12131]

## RELATIVE FREQUENCY OF VIABLE AND LETHAL GENE MUTATIONS INDUCED IN MULBERRY SILKWORM BY GAMMA-RAYS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 272, No 6, Apr 84  
(manuscript received 10 Jan 84) pp 1504-1507

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[Abstract] The goal of this work was to develop a rapid method for determination of the fractions of lethal and viable gene mutations applicable to mulberry silkworm. The study consisted of two subexperiments: in one, the females were irradiated with 4 kR; in the second--the males; then these groups were mated with  $w_2/w_2$  (control) and  $+^{w2}/+^{w2}$  and  $+^{w2}/-$  animals. Analysis of the data showed that the mutations frequency was 5-6 times higher in the variant in which the females were irradiated than in the one with irradiated males. This agreed with other reported data and was due to the fact that meiosis was reached in males prior to irradiation and in females after the exposure. Irradiation of females resulted in the viable:lethal mutation rate of about 1:3, while in males it was closer to 6:4. References 4: 2 Russian, 2 Western.  
[646-7813]

UDC 575.1.579

## CONSTRUCTION AND CHARACTERIZATION OF MINI-MU PHAGES

Moscow GENETIKA in Russian Vol 20, No 1, Jan 84  
(manuscript received 17 Jan 83, in final form 20 Apr 83) pp 5-15

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[Abstract] Various procedures have been used for manipulating Mu DNA in vivo or in vitro to produce deletional forms known as mini-Mu phages. The present article reports on mini-Mu phages produced by joining both ends of the phage in a single plasmid in straight orientation using liquid and 1.5% agar LB and M9 media with added ampicillin (100 mcg/ml), chloramphenicol (50 mcg/ml), tetracyclin (20 mcg/ml) and kanamycin (50 mcg/ml). Restriction endonucleases EcoRI, SalGI, HindIII and PstI, polynucleotideligases T4 and HpaI were also added before electrophoresis and mutagenesis procedures. The cloning of Mu DNA end segments in multi-copy vectors, inactivation of the kil gene in pRM11 plasmid to produce mini-Mu phages and other procedures produced six hybrid plasmids with the c- and S-ends of Mu DNA, three of which were straight in orientation. Biological studies showed that

lysogenic cells that affected only mini-Mu4Ap with an inactivated kil gene were thermally sensitive, with an effectiveness  $10^3$  less at 42°C than at 32°C. Resolution of cointegrators was found to take place by reciprocal recombination or through hypothetical Mu-dependent site-specific recombination. Other factors of cointegration and transposition, including RecA-dependent inversion of DNA fragments, offer plasmid materials for further studies. Figures 5; references 35: 4 Russian, 31 Western.  
[1506-12131]

UDC 575.1.579

#### INTEGRATION OF MINI-MU PHAGE INTO MULTICOPY PLASMIDS

Moscow GENETIKA Vol 20, No 1, Jan 84

(manuscript received 17 Jan 83, in final form 20 Apr 83) pp 16-25

MOGUTOV, M. A., KOBETS, N. S., VELIKODVORSKAYA, G. A., ANDRIANOV, V. M. and PIRUZYAN, E. S., Institute of Molecular Genetics, USSR Academy of Sciences, Moscow

[Abstract] The Mu bacteriophage, which has all the properties of a typical bacterial transposon, serves as an excellent model for study of molecular transposition mechanisms, but certain difficulties have been encountered in such studies. The present article reports on creation of plasmids and variants with deleted central EcoRI fragments, along with study of integrational properties of mini-Mu phages. Various strains of *E. coli* used included EP501-C600(MuX), produced for this study. Markers were introduced into DNA in vitro by a substitution method. Experimental data are given for integration of Mu into pRP1.2 in various *E. coli* strains. Results indicated that there was no difference between cultivated and wild strains. Only 12% of  $Tc^r/Mc^r$ -clones were sensitive to temperature and produced Mucts62 under thermoinduction. The deletion of the Eco-RI-fragment of Mu phage DNA was achieved by hydrolyzing EcoRI with polynucleotidylase T4, followed by transformation of *E. coli* EP501 with a defective MuX phage in the chromosome. The integrational properties of mini-Mu phages also aided in production of plasmids with a ColE1 replicon containing a mini-Mu4 insertion. Maximum mobilization frequency in fusing replicons was achieved with 20-minute induction. Target plasmids with mini-Mu4 were produced by either stabilization of the cointegrate in the RecA-recipient and subsequent resolution in  $Rec^+$  cells, or by direct recovery in the  $Rec^+$ -recipient. Figures 4; references 18: 4 Russian, 14 Western.  
[1506-12131]

FROST- AND WINTER-RESISTANCE OF  $F_1$  AND  $F_2$  HYBRIDS OF WINTER TRITICALE WITH SPRING WHEATS

Moscow GENETIKA in Russian Vol 20, No 1, Jan 84  
(manuscript received 28 Jan 83) pp 82-89

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[Abstract] Severe winter conditions are especially hard on many hybrids of wheat and rye. Reciprocal winter triticales strains developed in the USSR in recent years have equalled or surpassed the resistance of normal wheats, but still are not as hardy as rye. The present article reports on tests of 35 variants of reciprocal winter and spring wheats and hexaploidal triticales during 1981 and 1982. The tests sought to determine specific roles of various domestic Soviet and imported hybrid wheats and triticales in parent properties of hardiness. Weather conditions that did not contribute to plant "tempering" in 1981 are also discussed. The wintering ability of the hybrids was found to depend chiefly on the winter-grain parent's hardiness. Laboratory experiments with the two triticales strains eventually identified as  $F_1$  and  $F_2$  showed that the former was more dependably resistant to frost and cold, and it was regarded as the most promising for field use.

References 16: 15 Russian, 1 Western.

[1506-12131]

## GENETIC ANALYSIS OF "CORNGRASS" MACROMUTATION IN CORN

Moscow GENETIKA in Russian Vol 20, No 1, Jan 84  
(manuscript received 17 Feb 83) pp 90-99

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[Abstract] Of special interest for genetics are the sharp deviations from normal growth found in certain plants after seeds are exposed to X-rays. Corn has been shown to go through three dominant mutations, called teopods 1 and 2 (Tp1 and Tp2) and "Corn grass" (Cg). The present article reports on Soviet observations of this phenomenon beginning in 1962, when V. N. Lysikov discovered the Cg type in gamma-irradiated VIR-44 corn. Variations in penetration and expressivity of the mutation, gene modifiers and genetic instability are discussed. After initial discovery, samples of the macro-mutation have been obtained by free- or self-pollination and selection. Moderate and pronounced mutant types, the latter forming bushes with thin

stems and little or no tassles, were identified. Resolution of heterozygote and homozygote factors was conducted to identify a dominant gene that caused Corn grass mutation in varying degrees, in strain 220; the gene was labeled  $Cg_2$ , and was attributed to either chance separation of recessive modifying genes or instability of  $Cg_2$ . Results suggested that the extent of mutation depended on the gene "dose". Further experiments sought to test the  $Cg_2$  gene effect in other lines and to localize  $Cg_2$  mutations. While the  $Cg_2$  macromutation was unstable, homozygous sublines with  $Cg_2/Cg_2$  have also been encountered that are stable. Figures 3; references 10: 4 Russian, 6 Western.

[1506-12131]

UDC 576.312.36

#### STATISTICAL ANALYSIS OF ELIMINATION OF CHROMOSOME TYPE ABERRATION AND FATE OF ABERRANT CELLS

Moscow GENETIKA in Russian Vol 20, No 1, Jan 84  
(manuscript received 1 Mar 83) pp 144-154

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[Abstract] Elimination of chromosome and resultant cell aberrations has been a persistent problem for geneticists. Its traditional treatment by comparing cytogenetic effects has provided only approximate perceptions of the processes involved. The present article reports on statistical analysis principles for predicting the probability of survival of radiation-induced aberrations of the chromosome type that take into account possible disturbances caused by the presence of 5-bromodesoxyuridine (BDU) during cell cultivation. Healthy whole blood was subjected to 75, 150, 225 and 300 rads of gamma-radiation from  $Co^{60}$ . Then various aberrations were noted, such as di- and tricentric chromosomes, acentric paired fragments, centric rings, interstitial deletions and acentric fragments, as well as other atypical chromosome structures. The side effect of BDU in staining sister chromatids is noted, but the authors conclude that its concentration is not a determinant of aberration distribution. Sixteen types of aberrant cells were identified on the basis of the features observed. The previously reported Poisson distribution of aberrations is confirmed for dicentric cells, but other types are found to differ from that theoretical distribution. Theoretical hypotheses are offered to determine the number of irradiated cells eliminated in mitosis I and to assess the portion of original cells with dicentric cells shifting to mitosis II. Where sister chromatid exchange takes place, the transfer of chromosome anomalies is reduced by as much as 50%. Further "fate" predictions require added research. References 14: 12 Russian, 2 Western.

[1506-12131]

GENETIC STUDY OF PLASMID INTEGRATION IN YEAST CHROMOSOMES REPORT 1. EFFECT OF INTEGRATION OF EPISOMAL PLASMID IN MEIOTIC CROSSOVER IN CHROMOSOME 3

Moscow GENETIKA in Russian Vol 20, No 2, Feb 84  
(manuscript received 26 Oct 82) pp 197-204

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[Abstract] Chimera yeast plasmids used in genetic engineering tests fall into the classes of integrative, replicative and episomal plasmids. Integration of chimera plasmids into heterologous genomes such as those of Saccharomycetes can lead to directed inclusion of alien genetic information in chromosomes and stable transmission during cell division. The present article reports on such integration and its genetic impact. The strain used was *S. cerevisiae* produced at the test laboratory and a related hybrid. A minimum synthetic medium with added amino-acids and nitrogen bases was used for culturing, and clones were sought that contained integrated plasmids with selected instability features, as confirmed by tetrad analysis. Clones with a stable *Leu+* trait were found to contain the desired plasmid. Further observations were regarded as evidence of recombination leading to homozygotization in positions opposite the point of integration. Mapping showed that the plasmid integrated at locus *leu2* of chromosome 3 for stable integrants 2-8-7 and 2-8-8 and in an unidentified chromosome in stable 2-8x. The presence of the yeast transposon *Ty1* in plasmids with the *LEU2* gene was taken to be random integration. The maps show that plasmid integration in locus *leu2* suppresses crossover in the *leu-MAT* centromer region. Figures 1; references 19: 3 Russian, 16 Western.  
[1507-12131]

GENETIC STUDY OF PLASMID INTEGRATION IN YEAST CHROMOSOMES REPORT 2. ANALYSIS OF IRREGULAR MEIOTIC SEGREGATION

Moscow GENETIKA in Russian Vol 20, No 2, Feb 84  
(manuscript received 20 Dec 82) pp 205-211

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[Abstract] Genetic engineering of eukaryotic cells has promoted construction of chromosomes containing DNA fragments from various sources. The present article reports on study of Saccharomycetes yeast cells to determine the role of nonreciprocal recombination on markers of chromosome 3 where plasmid integration has previously taken place. The practical implications for protein production were also assessed. The authors used episomal plasmid

pYF91 based on bacterial plasmid pBR322 with fragments of yeast DNA containing the LEU-2 gene and the EcoRI-fragment of 2 $\mu$  DNA (2,4-megadalton). Meiotic segregation was studied in descendents of the stable integrants 2-8-7, 2-8-8 and 2-8x of genotype MATaleu2-3 (with marker LEU2 BLA) of ura3, crossed with strain 88A-D3008 of genotype MATalpha leu2-3 2-112 his4. Results showed that one or two segregants were always unstable and lost the Leu-2+ trait more than 50% of the time. The diploid 2-8xX88A did not show conversion segregation at leu2, had infrequent loss of integrated plasmid material and no homozygotization at the his4 marker. The irregularities of the segregation process are summarized. Figures 1; references 13: 4 Russian, 9 Western.

[1507-12131]

UDC 575.24:582.282.23

#### OBTAINING YEAST VECTOR MARKED BY MUTATION OF MULTIPLE ANTIBIOTIC RESISTANCE

Moscow GENETIKA in Russian Vol 20, No 2, Feb 84

(manuscript received 15 Mar 83) pp 212-218

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[Abstract] Mutants of *Sacch. cerevisiae* have been produced that have resistance to several antibiotics at the same time. While the authors who have reported this phenomenon tend to attribute it to the 2 $\mu$  yeast plasmid, no analysis of 2 $\mu$  DNA has supported that assertion. The present article reports on study of the Ant<sup>R</sup> mutation and its relationship to 2 $\mu$  DNA, and its value as a marker for yeast vector plasmid in its replicative part. The Ant<sup>R</sup> mutation was localized using cytoduction and transformation methods. Various MATa and MATalpha genotypes, as well as an *E. coli* strain and yeast vector pJDB219, were studied. Resistance to tetracycline and cycloheximide was assessed. The transmission of the Ant<sup>R</sup>- and Ant<sup>S</sup>-determinants was analyzed in individual heterokaryotic clones. Further subdivisions into Ant<sup>R</sup> and Ant<sup>RS</sup> classes were later made. Obtaining LEU2 Ant<sup>R</sup>-recombinant molecules was based on selection of the Leu+ Ant<sup>R</sup>-phenotype level of plasmid competition. Among some 50 analyzed retransformants obtained by introducing hybrid DNA into the DC-5 c<sup>o</sup> strain, eight were found to be resistant to both tested antibiotics, and also showed complete correlation between losses of Leu+ and Ant<sup>R</sup>-phenotypes, indicating linking of the Ant- and LEU2-genes. Figures 2; references 22: 4 Russian, 18 Western.

[1507-12131]

INFLUENCE OF AGE AND GENOTYPE OF MICE ON FREQUENCY OF SISTER CHROMATID EXCHANGE IN BONE MARROW CELLS

Moscow GENETIKA in Russian Vol 20, No 2, Feb 84  
(manuscript received 15 Apr 83) pp 260-265

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[Abstract] Intensive study of sister chromatid exchange (SCE) began soon after its discovery using 5-bromodesoxyuridine (BDU). Interest in mutation and in the effects of aging has grown, but results are contradictory. To resolve some of these problems, the authors studied the spontaneous and induced level of SCE in mice of the 101/H and C57BL/6J lines, which differ in chromosome mutability and ability to repair damaged DNA. Effects of aging were also observed. Mice were observed at 2 and a 17-20 months, with BDU injected abdominally at a dosage of 0.08 mg/g of body weight, and mitomycin at 4 mg/kg. Specimens were stained for study with azure-eosine on a phosphate buffer at pH 6.8. Results showed that without mitomycin, the distribution of SCE was erratic. The effect of mitomycin in 2-month-old mice was to raise the amount of SCE cells, until they accounted for about 40% of all cells. The author's results differed from those of earlier studies; this divergence is explained by differences in lines and colonies of mice studied and the upper limit of 20 months for specimens. The data collected suggest the conclusion that various factors influence SCE development and chromosome aberrations, and the reparation defect, which in any case is excisive, does not affect SCE levels. Chromosome stability seems to decrease with aging. References 35: 11 Russian, 24 Western.  
[1507-12131]

EVOLUTIONARY, CONFORMATIONAL AND FUNCTIONAL SIMILARITIES IN  $\alpha$ -,  $\beta$ -, AND  $\gamma$ -INTERFERON

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84  
(manuscript received 9 Sep 83) pp 242-246

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[Abstract] Experimentally-derived data and information in the published literature was analyzed to uncover evolutionary, conformational and functional similarities in the three major interferon classes: IFN- $\alpha$  (leucocytic), IFN- $\beta$  (fibroblastic), and IFN- $\gamma$  (immune). Evaluation of the primary, secondary and tertiary structures suggests that the genes for each class of interferon come from a common ancestral gene, and that IFN- $\gamma$  represents a product of the recombination of portions of the IFN- $\alpha$  and/or IFN- $\beta$  genes. The interferons share the major characteristics of a highly  $\alpha$ -helical globular conformation. Evolutionary conservatism in the loop region between spirals 2 and 3 in IFN- $\alpha$  and - $\beta$ , and spirals 3 and 4 in IFN- $\gamma$ , as well as the pronounced effects of the single amino acid substitutions on antiviral activity in this region, suggest that this region constitutes the active site of IFN. In addition, the region between amino acids 120 and 140 in IFN- $\alpha$  and - $\beta$  appear to form an active site that is functionally similar to active sites in  $\alpha_1$ -thymosin and certain toxins. Figures 2; references 15 (Western).  
[649-12172]

## Er-SUPPRESSORS: NONLYMPHOID IMMUNOREGULATORY CELLS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84  
(manuscript received 25 Jul 83) pp 247-249

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[Abstract] A mouse system was employed to test the possible effects of erythroid cells on humoral immune response. Splenic cells from donor mice were transferred to mice immunized with bovine albumin to test their effects on splenic antibody (IgM) three or seven days after the donor mice had been subjected to moderate hypoxia. While cells from donors unexposed to hypoxic conditions had no effects on antibody formation in the syngeneic hosts, cells from hypoxic donors decreased inductive and productive phases of IgM production by 54-65%. Density gradient centrifugation and actinomycin D treatment were used to demonstrate that the fraction responsible for the inhibitory effects consisted of erythroid elements, designated in this study as Er-suppressors. Even more pronounced inhibitory effects on the inductive phase were obtained with the transfer of embryonal hepatocytes selected during a period of intense erythropoiesis (11-12 days). These observations indicate that mature erythrocytes seem largely to inhibit the productive phase of IgM antibody formation, while the immature erythroid elements largely inhibit the inductive phase. Figures 1; references 9: 2 Russian, 7 Western.  
[649-12172]

UDC 577.217.27:577.115

## PRINCIPAL DIRECTIONS IN LIPID IMMUNOCHEMISTRY

Kiev UKRAINSKIY BIOKHMICHESKIY ZHURNAL in Russian Vol 56, No 3, May-Jun 84  
(manuscript received 28 Nov 83) pp 254-263

SHVETS, V. I. and KRASNOPOL'SKIY, Yu. M., Moscow Institute of Fine Chemical Technology imeni V. M. Lomonosov: Kharkov Plant for Production of Bacterial Preparations

[Abstract] Immunochemical properties of lipids were analyzed in respect to their antigenicity, immunogenicity and adjuvant effect. Current lipid research led to new diagnostic cardiolipid antigens with high immunochemical activity. Regardless of the many methods used to isolate antigens, all of them show identical qualitative lipid content differing only in the inter-relationship among various lipid components. Recent advances identified highly purified lipids, specially prepared lipid mixtures and their complexes with protein carriers, all showing increased immunogenicity of the antigen. Lipid

type adjuvants were among the first agents used in vaccination. Advances in lipid immunochemistry will soon find applications in diagnosis of infectious diseases, in preparation of therapeutic agents, investigation of autoimmune processes in humans, application of antisteroidal sera for analytical purposes, preparation of standard immune sera and other practical applications. Figures 2; references 57: 31 Russian, 26 Western.  
[1503-7813]

UDC 547,915:612.118.22

#### ROLE OF GLYCOSPHINGOLIPIDS IN IMMUNOLOGIC PROCESS

Kiev UKRAINSKIY BIOKHMICHESKIY ZHURNAL in Russian Vol 56, No 3, May-Jun 84  
(manuscript received 19 Sep 83) pp 263-267

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[Abstract] Numerous literature data have shown that glycosphingolipids, which are localized principally in plasma cell membranes are antigens and receptors or at least components of receptor complexes. Glycosphingolipids hence participate in immunologic processes as antigens of immunocompetent cells and target cells as well as receptors of immunocompetent cells. Finally, they can transmit information between various types of immunocompetent cells, i.e., serve as mediators and modulators of immune response. Literature data supporting these statements are here reviewed in three sub-headings: glycosphingolipids as markers of immunocompetent cells, as receptors of immunocompetent cells and as modulators of immune response. Possible effect of glycosphingolipids on immune response during tumor growth was noted. References 48: 5 Russian, 43 Western.  
[1503-7813]

UDC 616.72-007.17.085.849.19-036.8

EFFECTIVENESS OF COMBINED LASER RADIATION IN TREATMENT OF DEGENERATIVE DYSTROPHIC DISEASES

Moscow ORTOPEDIYA, TRAVMATOLOGIYA I PROTEZIROVANIYE in Russian No 5, May 84  
(manuscript received 13 Jul 83) pp 6-9

[Article by A. S. Kryuk, V. A. Mostovnikov, N. S. Serdyuchenko, I. V. Khokhlov, N. A. Dzhuguryan, A. F. Lobazov, and O. P. Kozlovskaya; Department of Traumatology, Orthopedics, and Field Surgery (Professor A. S. Kryuk, chief), Minsk Medical Institute, Clinical Hospital No 6, and the Physics Institute (B. I. Stepanov, academician of BSSR Academy of Sciences, director) of the BSSR Academy of Sciences, Minsk]

[Text] The problem of treating patients with degenerative dystrophic diseases of the joints and vertebral column is a complex and very important task. In recent years the light of low-intensity lasers has been used more and more in clinical practice. Some experience has already been gained in treating deformative osteoarthritis and intervertebral osteochondrosis with low-intensity helium-neon lasers generated in the red range of the spectrum with a wave length of 632.8 nm [1-3, 8].

The aim of the present study was to develop a new, more effective method of laser therapy on the basis of research on the stimulating effect of laser radiation of varying wave lengths on experimental animals.

Data in the literature indicate that with osteochondrosis there is a reorganization of the pathways of energy metabolism which is accompanied by a drop in the level of ATP in the blood [7] and a change in the speed of oxidative reduction processes [6].

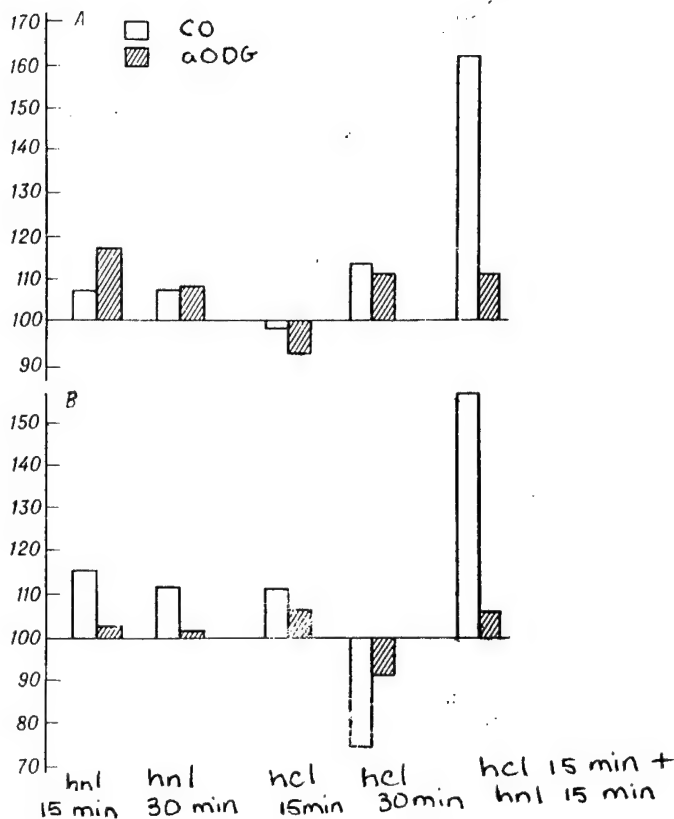
It was established earlier that the effect of helium-neon laser radiation on experimental animals leads to substantial changes in the activity of bioenergetic enzymes in the body [4, 5]. It has been demonstrated that when using a helium-neon laser at 200 milliwatts/cm<sup>2</sup>, the greatest activation of enzymes occurs with a 30-minute exposure. In this case the activation of the enzymes studied occurs in organs lying in the direct exposure zone, as well as in those that are not in the area of direct laser radiation. This indicates that laser radiation in the red range of the spectrum has a general stimulative effect on the body, which is important in treating diseases such as degenerative osteoarthritis and intervertebral osteochondrosis. Therefore, in order to meet the goal of the present study, we used an analysis of the effect

of laser radiation of varying parameters on the activity of the most important oxidative reduction enzymes in energy metabolism.

Experiments were performed on male white rats weighing 120-180 g. In addition to the helium-neon laser LG-75-1 that has been used before ( $\lambda = 632.8$  nm,  $R = 10$  milliwatts), we also used a helium-cadmium laser LG-31 ( $\lambda = 441$  nm,  $R = 10$  milliwatts). The radiation was applied locally to the surface of the animal's helix, which was a convenient method because of the absence of hair on the surface. The enzymatic activity was analyzed in the mitochondria of the large cerebral hemispheres and heart muscles of the white rats. The activity of alpha-oxoglutarate dehydrogenase was determined according to the method described by Nordmann et al., and the activity of cytochrome oxidase was determined using the method described by Straus. The activity was expressed in micrograms of formazan and indophenol per milligram of protein. The protein was determined using Louri's method.

It was established the effectiveness of stimulation depends to a significant extent on the density strength of the radiation. With optimum exposure to helium-neon laser radiation the greatest increase in enzymatic activity (20-50 percent depending on the enzymes and organs being analyzed) was observed when the laser radiation had a density strength of 100-300 milliwatts/cm<sup>2</sup>. A reduction in strength to 5 milliwatts/cm<sup>2</sup> leads to a decrease in the stimulative effect. With a high density strength, such as 2000 milliwatts/cm<sup>2</sup>, there is either a decline in the stimulative effect or even a considerable suppression of enzymatic activity. Thus, in order to obtain the maximum stimulative effect we recommend the use of laser radiation at a strength of 100-300 milliwatts/cm<sup>2</sup>.

Further experiments were aimed at clarifying the comparative effectiveness of laser radiation in the blue and red ranges of the spectrum. The density strength of the laser radiation was 100 milliwatts/cm<sup>2</sup>. The experiments showed some difference in the optimal doses of radiation for helium-neon and helium-cadmium lasers (see figure). For example, when animals were exposed to helium-cadmium laser radiation for 30 minutes, there was significant suppression (10-25 percent) of the activity of alpha-oxoglutarate dehydrogenase and cytochrome oxidase in the brain; while the same dose of helium-neon laser radiation caused an increase in enzymatic activity of approximately 10 percent. When the exposure to helium-cadmium radiation was reduced to 15 minutes, there was a 10-12 percent increase in the activity of alpha-oxoglutarate dehydrogenase and cytochrome oxidase in the brain. From the data we obtained we established that with a fixed dose there is a correlation between the effectiveness of laser radiation and the wave length. The greatest stimulative effect was observed when the experimental animals were exposed to combined laser radiation--first blue, and then red laser light. In this case there was an increase in the activity of bioenergetic enzymes of up to 50-60 percent, which led to a significant increase in the supply of energy to the tissues.



CO--cytochrome oxidase; aODG--alpha oxoglutarate dehydrogenase;

hnl--helium-neon laser; hcl--helium-cadmium laser;

The activity of alpha-oxoglutarate dehydrogenase and cytochrome oxidase in the heart (A) and brain (B) when white rats are exposed to local radiation of helium-neon and helium-cadmium lasers.

Combined radiation, like helium-neon laser radiation alone, has an over-all stimulative effect on the body. For example, there is marked activation of enzymes not only in the brain, but also in the heart, an organ that is located at a distance from the area that was exposed directly to the laser beam. These facts are of great importance in the treatment of diseases that involve not only local impairment, but also changes in other internal organs and tissues.

On the basis of biological research, a recommendation was made to use under clinical conditions the presumably more effective method of combined laser radiation in the blue<sub>2</sub> and red ranges of the spectrum with a density strength of 100-300 milliwatts/cm<sup>2</sup>.

Under clinical conditions, on the basis of these recommendations, we developed a method of laser therapy for degenerative dystrophic diseases of the skeletal system.

Patients with deformative osteoarthritis and intervertebral osteochondrosis being treated at the clinic were divided into two groups:

The first group contained 78 patients who were being treated with helium-neon laser alone;

The second group contained 69 patients who were being given combined laser treatment.

The duration of the disease ranged from 1 to 25 years. There were 22 men and 125 women. The age of the patients ranged from 22 to 75 years.

The first group included 32 patients with deformative osteoarthritis and 46 with intervertebral osteochondrosis; they were treated with helium-neon laser radiation with a density strength of 100 milliwatts/cm<sup>2</sup>. The laser light pencil was aimed, with the help of a specially designed device, at the pathological sites which were located paravertebrally on both sides of the vertebral column in the case of intervertebral osteochondrosis; and at the painful areas in a projection of the articulation in the case of deformative osteoarthritis. A total of 6-10 fields were used depending on how far the pathological process had spread. The exposure was 1-2 minutes per field.

The second group included 29 patients with deformative osteoarthritis and 40 patients with intervertebral osteochondrosis; they were treated with combined helium-cadmium (100 milliwatts/cm<sup>2</sup>) and helium-neon [100 milliwatts/cm<sup>2</sup>] laser radiation. First helium-cadmium laser radiation was applied to 6-10 pathological sites, and after a 10-minute interval helium-neon laser radiation was applied to the same fields. The exposure per field lasted up to 1 minute. The treatment consisted of 20 sessions.

During the treatment process we studied peripheral hemodynamics using the method of impedance plethysmography before the beginning of treatment and after 10 and 20 sessions.

The effectiveness of treatment was evaluated using a 3-point system.

A favorable result was obtained when the pain syndrome either disappeared or decreased significantly, along with constraint and para-articular edema; when the over-all condition of the patient improved, sleep became normal, sensitivity was restored, there was at least a 20-25 percent increase in movement, and the patient was again able to work. A satisfactory result was obtained when there was a reduction in pain, constraint, exudate, and arthritic symptoms, if these had occurred; partial restoration of the patient's ability to work; and a 10-15 percent increase in movement. If there was no noticeable effect from the treatment, the result was considered unsatisfactory.

Patients with deformative osteoarthritis and intervertebral osteochondrosis were treated according to the methods described. Before laser therapy was prescribed, all the patients had undergone various drug therapy, physical therapy, and sanatorium and spa treatment both on an in-patient and out-patient basis. In the majority of patients, however, these treatments proved to have no positive effects.

During the process of treatment using lasers generated in the red range of the spectrum, after 3-5 sessions 24 patients with deformative osteoarthritis and 38 patients with intervertebral osteochondrosis experienced an aggravation of the disease process, with increased pain, constraint, and deterioration of their over-all condition. In spite of the signs of aggravation, the laser therapy was not interrupted. After 7-9 sessions the aggravation process started to decline and positive changes began to take place.

With combined laser therapy 25 patients with deformative osteoarthritis and 36 with intervertebral osteochondrosis started to show symptoms of aggravation after 3-5 sessions. The aggravation process appeared after 10-12 sessions in 3 patients with deformative osteoarthritis and in 2 patients with intervertebral osteochondrosis. These patients had more pronounced pathological changes and 20 sessions of the helium-neon therapy proved to be ineffective.

A study of indicators of peripheral hemodynamics showed that after 10 sessions of laser therapy there was a significant improvement in the hemodynamic indicators only among the patients in the second group. After 20 sessions of treatment a significant improvement in the hemodynamic indicators was observed among patients in both the first and second groups, with a more pronounced effect in the case of combined laser radiation.

An analysis of the immediate results of treatment (1-3 years) showed that favorable results were obtained in 46 patients in the first group (57.2 percent) and in 55 patients in the second group (79.6 percent); satisfactory results were obtained in 16 patients in the first group (21.4 percent) and in 10 patients in the second group (14.5 percent); no effect was observed in 16 patients in the first group (21.4 percent) and in 4 patients in the second group (6.0 percent). The best results were obtained among patients who had had the disease for up to 10 years. No effect was observed among 14 patients with third and fourth stage deformative osteoarthritis of the hip joint and in 6 patients with a generalized form of intervertebral osteochondrosis.

Thus the results show that in the treatment of deformative osteoarthritis and intervertebral osteochondrosis, combined local laser radiation has a more pronounced effect than helium-neon laser radiation alone. Evidence of this can be seen in the favorable effect obtained in 80 percent of the patients in the second group compared to 57 percent of the patients in the first group. The effectiveness of the treatment was expressed by a significant reduction in the pain syndrome, edema, and constraint; an improvement in the patients' over-all condition; restoration of the patients' ability to work; and an improvement in the patients' indicators of peripheral hemodynamics.

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CSO: 1840/1063

# BRIEF

MEDICATION ADMINISTERED BY LASER--A most unusual method for the administration of pharmaceutical agents to the body of a patient is being used at the Central Scientific Research Institute for Health Resort Science and Physiotherapy. The substance is applied to the skin and then irradiated with a low-power neon-helium laser for 5-10 minutes. The chemical structure of the agent remains fully intact during this procedure. [By S. Mindelevich]  
[Text] [Moscow KOMSOMOL'SKAYA PRAVDA in Russian 21 Jun 84 p 4 (14)] 12262

CSO: 1840/668

MICROSURGERY: VESSEL COAGULATION WITH LASER

Riga NAUKA I TEKHNIKA in Russian No 2, Feb 84 pp 26-27

KUPCH, Ya., Director and CHERNYAKOV, V., Senior Scientist of the Neuroangiologic Group of Central Scientific Research Laboratory, Riga Medical Institute

[Abstract] Laser beams have two important properties: high directionality and high energy density, making it possible to focus a light beam and to achieve a microscopic surface area. A laser beam rapidly heats up the biological tissue. Surgeons use laser beams for cutting and coagulation of tissue. Laser "scalpels" are effective because they cause little bleeding. Argon and neodymium lasers are especially useful in surgery because their beams do not scatter and they can be focused down to 50  $\mu\text{m}$  by means of fiber optics; high energy of an argon laser beam is absorbed within a thickness of 100  $\mu\text{m}$ ; it can be used in microsurgery of vessels with internal diameter of 0.3 mm. In animal experiments it was shown that biomechanical strength of laser juncture is stronger than that of a thread suture. Laser surgery is simpler to perform and takes less time; it is adaptable to microscopic surgical procedures.  
[626-7813]

UDC 616.31-018.72+616.321-018.72]-003.93:615.849.19

FEATURES OF REGENERATION OF MOUTH AND THROAT MUCOUS MEMBRANE UNDER EFFECT OF HELIUM-NEON LASER

Leningrad VESTNIK KHIRURGII IMENI I. I. GREKOVA in Russian No 5, May 84 (manuscript received 6 Jun 83) pp 64-65

BEREZIN, Yu. D., IVANOV, B. S., PLUZHNIKOV, M. S., PROCHUKHANOV, R. A. and SAMSONOVA, I. Ye., First Leningrad Medical Institute imeni Academician I. P. Pavlov; State Optical Institute imeni S. I. Vavilov, Leningrad

[Abstract] Clinical use of low-intensity helium-neon lasers for mouth and throat operations has expanded in recent years because of their reputed antiphlogistic and analgesic effects. The present article reports on a comparison of the therapeutic effects of such laser procedures with prior

techniques in 46 patients 18-47 years of age suffering from chronic tonsillitis. Laser treatments were administered to 20 patients using a 5 mm spot held 2 mm from the irradiated tissue. Results showed that laser treatment brought less swelling, and activated enzymes of aerobic and anaerobic glycolysis, thus promoting healing. Parallel activation of acid phosphatase and intracellular metabolism in regenerating epithelia was also noted. Thus, healing was markedly accelerated by use of helium-neon laser treatment. References 5 (Russian).  
[1064-12131]

PROPERTIES OF CLOTHING IN THERMAL LESIONS

Moscow ORTOPEDIYA, TRAVMATOLOGIYA I PROTEZIROVANIYE in Russian No 5, May 84  
(manuscript received 4 Jan 83) pp 43-46

[Article by D. Lepene, J. Novak, L. Nemet, M. Denei, and J. Gog; Technology of Organic Chemistry Department, Budapest Technical University; Central Hospital; Medical Industry Scientific Research Institute; Danube Petroleum Industry Enterprise]

[Text] Medical literature contains little information on the role of clothing in burn lesions.

We studied clothing materials from two points of view: their combustion properties and their protective effect.

Combustion properties include: the temperature of ignition, the temperature of spontaneous combustion, the speed of combustion, the heat of combustion, the toxicity of the products of decomposition, and the behavior of the material when it is heated and when it burns (thermoplasticity).

The protective effect means that a person wearing the clothing is protected from injury for a certain length of time, or the injury is not severe enough to interfere significantly with the person's ability to work. The protective effect takes place up until the clothing itself is damaged. It is determined primarily by the quality of the material in the clothing. From this standpoint the ignition temperature and spontaneous combustion temperature take on special importance. If the clothing does not catch on fire, then its protective effect depends on the material only to an insignificant extent. In this case the thickness of the textile fabric plays a critical role.

The ignition temperature is also influenced by how the clothing is soiled. For example, if clothing is soiled with some kind of fuel (fats, perhaps), its inflammability rises considerably. Inflammability is also affected by how worn the clothing is, especially if the ignition temperature has been raised by means of some finishing treatment (when the treatment produces a higher ignition temperature and a lower burning rate). Under the influence of cleaning (washing, dry cleaning) the finishing treatment is removed and this leads to a reduction in the protective effect.

After the protective effect disappears, when the clothing ignites or melts, the toxicity of the burning and melting products becomes of immediate importance. It is widely known, for example, that polyacrylonitrile fibers can form hydrogen cyanide and polychlorvinyl fibers can form hydrochloric acid or formaldehyde. Carbon monoxide is also formed when the combustion is incomplete.

In our study of the properties of burning clothing we did not limit ourselves just to research on clothing materials, since their condition during combustion is determined by their form (cut) and the process by which they were produced.

The lower layer in areas where fabric is sewn together (pockets, collars, pleats) can remain intact when there is severe damage.

In order to study the role of clothing we conducted an experiment on animals using a model. We used four stitches to attach a piece (or pieces) of material to sections of skin on the back of experimental animals from which the fur had been removed and that were of a corresponding size. We determined the skin temperature under varying thermal conditions and the degree of damage to the fabrics.

We applied radiation at a strength of 9.15-1.35 J/sec for 100 sec. A total of 410 tests were done. The results we obtained were analyzed on an IBM 360 computer.

In the analysis we used data from a paper we published earlier and the latest data found in special literature on textile physics.

There was a wide range in the skin temperature of the sections covered by "clothing." There was no significant difference in the temperature at which the structure of the clothing was destroyed and the skin temperature with different types of material and varying layers of clothing.

A statistically significant difference ( $P < 0.001$ ) was found between the control groups and groups with any type of clothing or with a combination of various materials. No distinctive difference was found among the number of layers of clothing.

This phenomenon apparently follows the "all-or-nothing" law. The protective effect of clothing was manifested in the presence of radiation energy of any intensity (that we studied).

The results we obtained correspond to some of the data in the literature [1, 2] and they contradict some other findings [3]. The reason for the discrepancy may be a difference between the materials studied.

From the standpoint of our topic, one of the most important factors is the physical indicator which can be used to help establish the limit up to which the clothing's effect can be considered protective, when this protective effect ends and turns into a destructive factor.

On the basis of a study of the physical properties of clothing materials to determine this maximum limit, we propose the use of the so-called maximum temperature of the protective effect ( $\Theta$ ).

The maximum temperature of the protective effect represents the lowest temperature at which a certain type of fiber-based material undergoes some microscopic, yet visibly tangible change. These changes can include melting, disintegration, charring, and possibly burning of the fibers. If it ( $\Theta$ ) represents not a single, specific value, but the interval between two temperature values, then it makes sense to define the maximum initial temperature of this interval. With a temperature above  $\Theta$  it is unlikely that there will be a protective effect: it will not be evident or the clothing will aggravate the trauma.

The accompanying table contains values of  $\Theta$  for various types of woven fabric.

The data presented in the table show that the values of  $\Theta$  for thermoplastic materials (plastic, polypropylene, polyester, polyamide, polyacrylonitrile) are relatively low and range from 150° to 260° C. The value of  $\Theta$  for woolen material is quite high. This means that woolen clothing provides more reliable protection against burns. From the standpoint of the value of  $\Theta$ , cotton clothing is also favorable; that is, clothing made from natural fibers (wool, cotton) provides the greatest protection.

Maximum temperature of the protective effect of various materials

Material	Temperature (° C)
Polyvinylchloride	130
Polypropylene	150
Polyacryl 6	220
Polyurethane	230
Polyester	260
Polyacrylonitrile	300
Nomex	315
Polytetrafluorethylene	405
Sulfone	415
Wool	560
Fiberglass	840

By studying changes in subcutaneous temperature over the course of 100 seconds and the extent to which the fabric was damaged after 100 seconds using various methods of heat transfer (radiation and conduction), we determined that in the experimental group of animals with no clothing the correlation coefficient of the subcutaneous temperature was 94 percent.

If the study was done using radiation heat of 600° C, the extent of destruction of the clothing fabric and the change in subcutaneous temperature were correlated more closely in terms of time. Here the correlation coefficient was 99 percent.

When the same measurements were made on animals covered with clothing made out of different textile materials, the correlation coefficient was only 36 percent.

This result, along with previous observations, indicate that under certain conditions clothing has a protective effect, but it can also intensify the destructive effects; this also indicates that the extent of injury to the skin caused by radiation energy is determined primarily not by the quantity and type of layers of clothing, but by the presence or absence of clothing.

The fact is that ignition (or combustion) of clothing (material) has less favorable parameters (the value of  $\theta$  is also lower) in isolation from skin, than when the clothing and skin form a (bio)physical system.

This means that skin and the clothing covering it represent a system with new properties. From this it follows that the properties of clothing determined in vitro cannot be applied (in every case) to clothing when it is being worn. Thus, a reliable description of various textile articles from the standpoint of burn injury is possible only by conducting experiments on animals.

The accuracy of the conclusions made on the basis of experimental results was verified in a study of clinical experience.

A total of 209 cases were found in medical files in which clothing played a role that could be evaluated in retrospect. A protective effect was found in 32 percent of the cases.

On the basis of an analysis of the history of injuries and the clothing of the burned individuals, as well as of the results of experiments on animals, we reached the following conclusions:

1. Any material or any textile article provides protection against burns or reduces the extent and depth of burn injuries up until the burning action destroys the clothing material.

The combustion heat of textile materials ranges from 16.74 to 41.85 J/kg, that is, the upper value is the same as the combustion heat of gasoline. Thus, if polypropylene clothing ignites, the same quantity of heat is formed as when the same amount of gasoline burns.

2. When there is contact with a hot object, thermal insulation is an immediate concern. The protective effect is determined primarily by the quantity of air in the pores, since the thermal insulation capacity of air is significantly higher than that of clothing. Consequently, the thicker the layer of clothing, the greater its thermal insulation capacity.

3. Part of radiation energy is reflected by clothing, and only penetrating, absorbed energy causes injury. The protective effect, a reduction in the injurious effects, is also demonstrated in the case of reflection. From this standpoint the best clothing is white with a smooth surface.

4. Hot liquids and steam soak into clothing. The injury caused is proportional to the temperature and quantity of the liquid. In some cases the value of  $\Theta$  is not important. Instead, the time of exposure becomes the critical factor and it does not depend on the clothing material.

In conclusion, we can assert that the maximum temperature ( $\Theta$ ) which we have introduced represents the parameter that characterizes the protective effect or danger of textile materials in burn injuries, with the exception of scalding. Therefore, this indicator makes it possible to perform comparative research on various textile materials. At a temperature below  $\Theta$  there is a more or less pronounced protective effect, and above  $\Theta$  the clothing intensifies burn injuries.

Special clothing should be selected so that in potential accidental situations the temperature of its outer layer does not reach  $\Theta$  until the site of the fire can be left.

From the standpoint of  $\Theta$ , natural fibers are, as a rule, more favorable than synthetic products. Nonetheless, over the last decade the use of synthetic fibers has become more widespread. Of the natural fibers, wool has the most favorable properties.

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ROLE OF INTRACRANIAL HYPERTENSION IN DEVELOPMENT OF HYDROCEPHALUS IN  
CHRONIC ALCOHOLICS

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[Text] Pathological and pneumoencephalographic studies [1, 2, 9] of chronic  
alcoholics revealed periventricular atrophy and atrophy of the cerebral cor-  
tex combined with dilatation of the ventricular system and subarachnoid  
spaces. The widening of lateral ventricles fluctuated over a significant  
range, and it was symmetrical. Enlargement of the third ventricle was  
usually associated with dilatation of lateral ones. In virtually half the  
patients with chronic alcoholism with pneumoencephalographically demonstrated  
hydrocephalus, who were under observation by A. P. Demichev and N. I.  
Grigorovich [3], spinal fluid pressure was elevated from 300 to 600 mm water,  
as determined by lumbar puncture in seated position. Computer tomography of  
the brain of chronic alcoholics [7] also revealed dilatation of the third and  
lateral ventricles, and cortical atrophy. At the present time echoencephalo-  
graphy can be used, in addition to clinical neurological examination, to  
assess presence and severity of disturbances referable to dynamics of spinal  
fluid. We performed a neurological and echoencephalographic examination of  
337 patients with chronic alcoholism (334 men and 3 women). There were no  
indications in the patients' history of prior cerebrocranial trauma, neuro-  
infection or other diseases of the nervous system. Examinations were made in  
the absence of withdrawal symptoms. The echoencephalogram (EchoEG) was  
recorded on an ECHO-11 unit. We beamed waves at the temporal and parietal  
regions of both hemispheres. The M echo was identified from symmetrical  
points in both hemispheres; evaluation was made of the shape of the M echo,  
distance to it from two sides; we calculated the width of the third ventricle  
and the pallium index. The method of I. A. Skorunskiy [6] was used to  
evaluate the amplitude of pulsations of echo signals. Dilation of the third  
ventricle by more than 6.5 mm, increase in pallium index of more than 2.3,  
which is indicative of dilatation of lateral ventricles, appearance of a  
double-wave, multipeak variant of M echo with widened base were interpreted

as signs of internal hydrocephalus. An increase of more than 30% in amplitude of echo pulsation was indicative of intracranial hypertension [6].

The patients were divided into five groups, according to nature and severity of changes in the EchoEG. The 1st group consisted of 101 patients with no pathological changes in the nervous system or changes in the EchoEG. The 2d group consisted of 17 patients with positive Brudzinskiy meningeal sign (inferior), presence of horizontal nystagmus, tenderness of trigeminal points, increased amplitude and rate of echo pulsation on the EchoEG which, in the opinion of a number of authors [4, 6], is indicative of intracranial hypertension. The 3d group consisted of 7 patients with positive Brudzinskiy sign (inferior), horizontal nystagmus, increased amplitude of echo pulsation, dilatation of third and lateral ventricles on the EchoEG; 3 of them presented convulsive seizures. The 4th group consisted of 35 patients with dilatation of the third (from 6.5 to 8.5 mm) and lateral ventricles; some patients had a positive Brudzinskiy sign (inferior), horizontal, narrow-range nystagmus. The patients of these four groups were admitted to the drug-abuse hospital because of severe pathological addiction to alcohol and inability to stop drinking as outpatients; they were diagnosed as 2d-stage chronic alcoholics (according to I. V. Strel'chuk). The 5th group consisted of 177 patients who had been admitted due to marked changes in the nervous system due to chronic alcoholic intoxication; most of them were diagnosed as 3d-stage chronic alcoholics. In addition to organic changes in the central nervous system (poor convergence, horizontal nystagmus, disorders referable to statics and coordination of movements, etc.), 88 of them had convulsive seizures with loss of consciousness, 89 presented signs of polyneuropathy. The EchoEG showed dilatation of the third (8-12 mm) and lateral ventricles in 173 patients, including 10, in whom this was combined with increased amplitude and rate of echo pulsations; 4 presented intensification of echo pulses without dilatation of the ventricular system. A lumbar puncture was performed on 47 patients of the 5th group. Spinal fluid pressure was elevated (230-320 mm water column) in 6 of these patients, in the presence of increased echo pulsation; spinal fluid pressure was normal in 41 patients with dilated ventricular system, according to EchoEG data. Protein content of spinal fluid ranged from 0.12 to 0.33<sup>0</sup>/100.

We observed a parallel between severity of EchoEG changes and age in patients of the 2d-4th groups. Thus, average age was  $32.1 \pm 1.6$  years in the 2d group,  $39.6 \pm 3.5$  in the 3d and  $45.2 \pm 1.4$  years in the 4th. The fact that the average age of patients without changes in the EchoEG (1st group) and with the most marked changes (5th group) was about the same ( $36.6 \pm 1.2$  and  $38.6 \pm 0.68$  years, respectively) is apparently related to amount of alcohol taken and individual constitutional distinctions. A more distinct correlation was found when we compared severity of EchoEG changes to duration of chronic alcoholism ( $5.1 \pm 0.9$  years in the 1st group,  $8.0 \pm 1.09$  in the 2d,  $13.4 \pm 1.9$  in the 3d,  $20.0 \pm 1.5$  in the 4th and  $20.0 \pm 7.3$  years in the 5th).

The studies of these patients, as well as patients in a state of acute alcoholic intoxication with the withdrawal symptom enable us to expound the following conception of the origin of hydrocephalus in the presence of chronic alcoholism. Alcoholic intoxication is associated with elevation of

intracranial pressure. This is indicated by the increase in amplitude and rate of echo-signal pulsation to 40-65%, which we found in 11 tests in individuals who consumed 0.8-1.0 g ethyl alcohol per kg weight. The increase in amplitude and rate of echo pulsations was preceded by maximum increase in blood alcohol content (to 1-1.6<sup>0</sup>/<sub>00</sub>). In all cases, pulsation of echo signals diminished to background levels after 3-4 h (10-25%), longer intensification of echo pulsations (up to 4 h) being observed with intake of large doses of alcohol. The change in the EchoEG was combined with appearance of narrow-range horizontal nystagmus, unstable simple and complicated Romberg pose. Examination of 110 patients with withdrawal symptoms revealed that 53% had a positive Brudzinskiy sign (inferior), 34% presented narrow-range horizontal nystagmus, 33% static ataxia, 38% accentuation of tendon reflexes, 7% pathological pyramidal Babinskiy and Oppenheim reflexes. These neurological symptoms, which are indicative of intracranial hypertension, were combined with increased amplitude of echo pulsations.

The meningeal signs and increased echo pulsations disappeared after the withdrawal symptom was removed, which is indicative of unstable elevation of intracranial pressure in patients with the withdrawal symptom.

Repeated elevation of intracranial pressure in the presence of acute alcoholic intoxication and the withdrawal syndrome leads to dilatation of the brain's ventricular system, at first transient and then persistent, as shown by our studies. The EchoEG of 39 patients with the withdrawal symptom showed dilatation of the third and lateral ventricles, which disappeared in 9 cases after elimination of the withdrawal syndrome.

Examination of 505 patients with chronic alcoholism without the withdrawal symptom, in the absence of history of cerebrocranial trauma, neuroinfection and other diseases of the nervous system, revealed a positive Brudzinskiy sign (inferior) in 35.6% of the cases, which was associated in many patients with poor convergence, incomplete lateral movement of eyeballs, horizontal nystagmus, tenderness upon applying pressure to supraorbital points, dilatation of veins in the fundus, which are symptoms indicative of elevated intracranial pressure. A lumbar puncture was performed on four patients. Spinal fluid pressure was elevated (210-265 mm water when the tap was made with patient in prone position), with normal protein and cell content. We should mention the distinctions of intracranial hypertension in chronic alcoholics. The patients did not report severe headache in the presence of significant elevation of intracranial pressure (260-265 mm water). This is apparently related to the effect of alcohol on baroreceptors of the dura mater, which are endings of the trigeminal nerve, or to gradual development of intracranial hypertension. According to data in the literature [8], alcohol readily penetrates into spinal fluid; 1.5 h after intake of 100 ml alcohol, its level in spinal fluid constitutes 1.5<sup>0</sup>/<sub>00</sub> (1.3<sup>0</sup>/<sub>00</sub> in blood), it gradually drops, and no alcohol is demonstrable in spinal fluid after 10-20 h. In our opinion, when alcohol flows through vascular plexi it can cause hyperproduction of spinal fluid. This is aided by elevation of arterial pressure, as well as other marked vegetative disturbances, which arise as a result of acute or chronic alcoholic intoxication and could be the cause of hyperemia of vascular plexi and hyperproduction of spinal fluid.

Elevation of intracranial pressure, which is observed in the presence of delirium tremens, could also be instrumental in development of hydrocephalus in chronic alcoholics. A lumbar tap performed for therapeutic purposes on 42 patients with delirium tremens revealed that spinal fluid pressure was drastically elevated (260-340 mm water with the tap made in prone position); in 37 of these cases, we took the EchoEG and found dilatation of the third ventricle (8-12 mm). The spinal tap was repeated 5-7 days after elimination of delirium tremens on 23 patients. Spinal fluid pressure was elevated, but to a lesser extent than in the presence of delirium tremens, constituting 240-300 mm water. In 18 cases, we repeated EchoEG at the same time, which showed the same dilatation of the third ventricle as during delirium tremens. This indicates that dilatation of the third ventricle was not a manifestation of delirium tremens, but the consequence of chronic alcoholic intoxication. L. M. Pussep [5] reported great changes in vascular plexi of cerebral ventricles in the presence of alcoholism (thickening of epithelium, disappearance of muscle sheath, impaired integrity of tunica media); evidently, this leads to decreased production of spinal fluid. For this reason, the hypertension-hydrocephalus syndrome changes to hydrocephalus without intracranial hypertension.

Our neurological examination of 994 patients with chronic alcoholism, for 500 of whom we recorded the EchoEG and on 93 of which a spinal tap was performed, warrants the conclusion that, in chronic alcoholics, the hypertension syndrome changes to the hypertension-hydrocephalus syndrome, which was represented in our studies by the third group of patients. The hypertension-hydrocephalus syndrome then changes to ventricular hydrocephalus, which was observed in the fourth group and most patients in the fifth. Courses of dehydration therapy in cases where clinical data, as well as EchoEG data, are indicative of the hypertensive (increased amplitude and rate of echo pulsation) or hypertension-hydrocephalus syndrome (dilatation of third and lateral ventricles, increased amplitude and rate of echo pulsation) are recommended for more frequent use in order to prevent hydrocephalus associated with chronic alcoholism.

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MATHEMATICAL METHOD OF DETECTING PATIENTS WITH HIGH RISK OF SUDDEN DEATH  
AND RECURRENT FATAL MYOCARDIAL INFARCTION

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[Text] Validated prognostication of course of illness and, particularly, degree  
of risk of fatal outcome is necessary to optimize individual programs of dis-  
pensary management of patients after myocardial infarction. Many works have  
been published on this score, in which the prognosis is evaluated on the basis  
of clinical, instrumentation and even invasive examination methods [4, 9, 10,  
13]. In several studies, postinfarction prognostication was made by mathema-  
tical methods also [6, 15, 16, 17]. At the same time, in the works dealing  
with the mathematical methods, special questions of forecasting the threat of  
some forms of complications were not explored, yet expressly this is the key  
to preventing them in a competent way.

We previously proposed a formula for a general postinfarction prognosis with  
qualitative evaluation [1, 5]. These data enabled us to undertake development  
of a mathematical method of forecasting recurrent coronary episodes: recurrent  
infarction, lethal outcome from it and sudden death. The mortality due to  
progressive circulatory insufficiency was not considered, since this type of  
course is clinically obvious.

Our objective here was to establish a rather simple to use mathematical cri-  
terion for detection among patients who have suffered myocardial infarction  
those with a high risk for recurrent coronary episodes within the next 3 years  
(sudden death, recurrent myocardial infarction with fatal and nonfatal outcome  
according to results of first year of observation). The problem was solved  
using methods of pattern recognition theory. The statistical material consisted  
of our own observations of 334 patients who had had myocardial infarction and  
were under subsequent observation for 5-20 years. On the examination card,  
we took into consideration data referable to 28 signs coded in a series of  
gradations in ascending order.

The mathematical solution was found in accordance with methods developed by Prof Yu. I. Neymark, which included use of recognition algorithms according to general similarity of tags and a modified linear minimax algorithm. Analysis revealed that it was possible to select 16 tags and derive a linear formula, which is presented in the form of a numerical index for each patient.

Below are the linear formula and coding system for forecasting the risk of sudden death and fatal recurrent infarction for patients who have already sustained myocardial infarction once.

1. Patient's age at the time of development of myocardial infarction: up to 25 years--0, 26-35 years--1, 36-45 years--2, 46-55 years--3, 56-65 years--4, over 65 years--6.
2. Angina prior to myocardial infarction: none--0, grade I--1, grade II--3.
3. Severity of acute period of illness: mild--0, moderately severe--1, severe--2.
4. Extent of coronary insufficiency in postinfarction period: 0-I--attacks no more than once a month or no more than once a week with increased loads--0; I-II--attacks several times a week with ordinary load--3; II--daily attacks with ordinary load (walking)--5; III--frequent daily tension and resting angina--7.
5. Stage of cardiac insufficiency in postinfarction period: none--0, I-1, IIA--3, IIB--6, III--7.
6. Enlargement of the heart: none--0, left margin (LM) along midclavicular line--1, LM 1 cm lateral to midclavicular line--3, LM not reaching left anterior axillary line (+2 cm)--5, LM along left anterior axillary line and beyond (severe cardiomegaly)--7.
7. Diastolic blood pressure: 50 mm Hg or lower--0, 51-70 mm Hg--1, 71-80 mm Hg--2, 81-100 mm Hg--3, 101-110 mm Hg--4, 111-120 mm Hg--6, 121 mm Hg or higher--7.
8. Chronic cardiac aneurysm: none--0, suspected aneurysm--3, present--6.
9. Anterior infarction: no--0, nonpenetrating, circumscribed--1, nonpenetrating, extensive--1, penetrating, circumscribed--3, penetrating, extensive--5.
10. Posterior infarction: no--0, nonpenetrating, circumscribed--1, nonpenetrating, extensive--2, penetrating, circumscribed--3, penetrating, extensive--5.
11. Sinus tachycardia: none--0, pulse 80-90/min--1, pulse 91-100/min--2, pulse 101-120/min--3, pulse 121/min or faster--5.
12. Sinus bradycardia: none--0, pulse 61-50/min--3, pulse 50-41/min--6, pulse 40/min or less--7.
13. Atrioventricular block: none--0, partial--3, total--7.
14. Block of left branch of bundle of His: none--0, partial--2, total--4.

15. Extent of BKG [ballistocardiogram] changes according to Brown: 0-I--0, II-1, III-4.

16. Adherence to regimen: yes--0, incomplete adherence--2, no adherence--5.

The linear formula for calculating the prognostic index (PI) is:

$$PI = 4X_1 + 9X_2 + 7X_3 + 6X_4 + 3X_5 + 8X_6 + 2X_7 + 7X_8 + 3X_9 + 4X_{10} + 3X_{11} + 4X_{12} + X_{13} + X_{14} + 6X_{15} + 2X_{16}$$

We found that about 70% of the patients with similar values for tags have the same outcome of illness. This means that sudden death and fatal recurrent myocardial infarction do not develop by chance, but are determined by the general condition of the cardiovascular system. Exogenous random factors (business trip, excitement, physical overload, etc.) only determine the time when they occur. The outcome was not predetermined in 30% of the patients, and it depended on various exogenous causes. Considering this circumstance, the threat of sudden death and recurrent myocardial infarction were viewed as a problem of determining the probability of development of recurrent infarction with fatal and nonfatal outcome and probability of sudden death.

In our cases, PI ranged from 10 to 360. The probability of an outcome was related rather well with the numerical determination of PI.

Table 1 shows that the probability of a good outcome is high with PI of less than 85. On the other hand, probability of fatal outcome due to recurrent infarction or sudden death increases concurrently with PI, and it is quite high when it exceeds 140. It is also significant that recurrent nonfatal myocardial infarction was virtually unpredictable with our program.

Table 1. Prognostic criteria for patients who sustained myocardial infarction

Value of prognostic index	Probability of good outcome	Probability of recurrent infarction with nonfatal outcome	Probability of sudden death or fatal recurrent infarction
PI<85	0.93	0.07	--
85≤PI<140	0.68	0.21	0.11
140<PI<180	0.16	0.23	0.61
PI>180	0.05	0.27	0.68

The method was tested on data referable to 168 patients who had undergone rehabilitation after myocardial infarction at a sanatorium or polyclinic. The same correlations were established. After 3-24 months, we found that 89% of those who expired had a PI of more than 140 and 74% of those who survived had a PI of less than 140. The survivors with PI of over 140 were under observation for less than 1 year, while the prognosis is given for 3 years.

It is interesting to analyze the main tags that carried the most pathological weight.

The program was constructed on the basis of the results of our own observations and analysis of a large volume of material from the literature referable to a several thousand cases. It was established that the prognosis following myocardial infarction is determined by two main factors: condition of coronary channel and functional characteristics of contractile myocardium. Not all authors recognize the influence of size of sustained myocardial infarction on the prognosis.

The predominant significance of degree of constriction of coronary arteries has been firmly established in coronarographic studies [9, 10]. Contractility of the left ventricle is a rather important prognostic determinant. A decrease in rate of maximum contraction, reduction of ejection fraction to less than 50%, elevation of end diastolic pressure and increase in volume of the left ventricle also worsen appreciably the prognosis of all coronary patients, as does circulatory insufficiency [7, 8, 13, 14]. At the same time, EKG data are also of substantial significance. It is known that the extensiveness of the lesion affects the prognosis, and it is also poorer in patients with involvement of the anterior wall [2, 12, 18]. Many studies demonstrated that sudden death is more frequent in the presence of complicated arrhythmias, atrioventricular block, block of left branch of the bundle of His and extrasystole of the R type on T [3, 4, 7]. The now numerous results of Holter monitoring failed to demonstrate a very close correlation between arrhythmia and atrioventricular block, on the one hand, and development of sudden death, on the other, in spite of expectations. There are data indicating the significance of decline of ST segment as a predictor of fatal outcome [11, 14, 19]. On the basis of these data, we selected tags that could reflect these changes according to clinical manifestations (Table 2), since the prognostic program was developed for use in polyclinic practice.

Table 2. Weight of most significant tags for predicting the course and outcome of the postinfarction period

No	Tag	Weight
X <sub>2</sub>	Angina pectoris prior to myocardial infarction	9
X <sub>6</sub>	Enlargement of heart	8
X <sub>3</sub>	Severity of acute period	7
X <sub>4</sub>	Severity of angina pectoris in postinfarction period	6
X <sub>10</sub>	Localization, depth and extensiveness of myocardial infarction	4

As can be seen in Table 2, of the 16 selected tags, a history of angina and postinfarction angina, enlargement of the heart and course of the acute period of myocardial infarction had the greatest weight. It is significant that the sign, "cardiac insufficiency," coincided with presence of cardiomegaly and had a lower weight. This is indicative of the vagueness of the concept of "cardiac insufficiency" and linear relationship between myocardial involvement and circulatory insufficiency. The highest weight of angina expressed the circumstance that myocardial infarction may be merely an episode in the stenosing involvement of the coronary bed, and expressly the latter determines the patient's fate.

The presence of arrhythmia turned out to be irrelevant in the studies, but it should be noted that the patients were not monitored. At first, we were concerned by the fact that partial atrioventricular blocks also failed to affect onset of a fatal outcome, in spite of the findings of other authors [7 and others]. However, upon further processing of the material, when we singled out menacing combinations of symptoms, so-called syndromes, we determined that an atrioventricular block combined with failure to adhere to the prescribed regimen worsened the prognosis substantially.

We failed to demonstrate an appreciable difference between forecasting the threat of sudden death or fatal recurrent myocardial infarction; however, the cases of death with high PI were referable expressly to sudden death.

Our observations enabled us to establish that simple clinical signs, the natural course of illness, are apparently linearly related to such determinants as end diastolic pressure, catheterization findings, size of the heart, etc. This could be sufficient grounds for outpatient use of mathematical prognostication.

Use of the formula in medical practice makes it possible to define the program of rehabilitation and therapeutic measures for patients after myocardial infarction. In the case of high risk of such complications, one should proceed with greater caution with rehabilitation measures. It is desirable to perform selective coronarography followed by an operation for an aortocoronary shunt if indicated. Picking up patients with high risk of sudden death acquires special meaning in view of the possibility of preventive therapy using  $\beta$ -blocking agents and the need for differentiated rehabilitation following myocardial infarction in aftercare sanatorium departments.

Thus, mathematical prognostication offers a clinical method of detecting patients with high risk of sudden death and fatal recurrent myocardial infarction.

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INCIDENCE OF ISCHEMIC HEART DISEASE AND INTENSITY OF VARIOUS RISK FACTORS  
FOR ISCHEMIC HEART DISEASE IN UNORGANIZED MALE POPULATION 20-69 YEARS OF AGE

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[Text] The high incidence of ischemic heart disease (IHD) among men 40-59 years of age has been confirmed by epidemiological studies in many economically developed countries [2, 3, 6, 7, 11-14]. The main risk factors of this disease have been defined [4, 5, 8-10]. Such studies are important to the planning of measures for primary and secondary prevention of cardiovascular diseases [1]. In view of the fact that they should be started as early as possible, it is necessary to know how IHD is formed at a young age, what is the intensity of risk factors and what influence they have on development of IHD in each decade of life, i.e., to evaluate the distinctions of association of IHD with the number of risk factors at a given age.

Our objective here was to investigate the incidence of IHD, its main forms and age-related changes in number of risk factors for this disease in the unorganized male population 20-69 years of age. In determining the number of IHD risk factors in the subjects, we took the following into consideration: hypercholesterolemia (HCE), arterial hypertension (AH), excess weight (EW), smoking and low physical activity. Still, this approach to evaluation of IHD risk factors has two flaws. In the first place, only five classical IHD risk factors are considered, yet researchers have been concerned more and more in recent times with factors such as psychoemotional stability, heredity, nutrition, hormonal disturbances, etc. In the second place, a more precise evaluation of the effect of risk factors on IHD involves construction of mathematical models based on multidimensional statistical analysis.

However, these flaws are compensated in part by the methodological simplicity of the proposed approach and possibility of making broad use of it in planning and implementing steps for mass-scale prevention of IHD.

We screened a random sample, of different decades of age, of unorganized male population 20-69 years old living in one of the administrative regions of Kiev. We examined a total of 3322 people, including 262 who were 20-29 years old, 299 30-39 years, 1295 40-49 years, 1152 50-59 years and 314 60-69 years.

We used the standard cardiological questionnaire of WHO in order to detect tension angina pectoris. Resting EKG was recorded on a 4-channel Mingograph-34 electrocardiograph in the 12 conventional leads, and it was evaluated using the Minnesota code.

IHD was diagnosed using strict and unstrict criteria, according to which we made a distinction between definite and possible IHD. The diagnosis of "definite IHD" was made when myocardial infarction was definitely present--MI (codes 1-1-1.2.7 without 1-2-8), tension angina pectoris or pain-free form of IHD (codes 4-1, 2; 5-1, 2 without 3-1,3). The diagnosis of "possible IHD" was made in the presence of "possible" MI in the history, possible sustained MI (codes 1.2,8; 1.3), possible ischemia (4-3; 5-3), arrhythmic form (6.1; 7.1; 8,3), myocardial ischemia with hypertrophy of the left ventricle (4-1,2; 5-1,2 with 3-1,3).

Blood plasma cholesterol was assayed on an AA-II automatic analyzer of the Technicon firm. HCE referred to blood serum cholesterol level in excess of 250 mg%.

BP levels were determined from 4 measurements, 2 on a Riva-Rocci sphygmomanometer and 2 on a "floating zero" instrument, and mean readings were taken for analysis. AH referred to systolic pressure in excess of 160 mm Hg and/or diastolic pressure in excess of 95 mm Hg.

EW was determined by measuring body weight W (in kilograms) and height H (in meters) with use of the  $W/H^2$  index. We considered that the subject was overweight if  $W/H^2 > 29$ .

Smoking and low physical activity were elicited from the data in a standard questionnaire for preventive examination. Subjects who sat when working for 5 h or more, whose active recreation took up less than 10 h per week, summer and winter, including walking to and from work, were placed in the category of individuals with low physical activity.

We see from the data listed in Table 1 that standardized incidence of both definite and possible IHD according to age constituted about 6% for the male population 20-69 years of age.

The incidence of definite IHD rose up to the age of 60 years in each successive decade by 2.5-3 times, as compared to the preceding decade, and that of possible IHD increased by 1.5-2 times. By the age of 60 years, the rate of increase in incidence of IHD diminished somewhat.

The increase in incidence of definite IHD became statistically reliable already when we moved from the 30-39 year decade to 40-49 years ( $P < 0.01$ ), and reliability persisted with further advance in age (40-49 and 50-59 years,  $P < 0.005$ ; 50-59 and 60-69 years,  $P < 0.05$ ). The incidence of possible IHD rose reliably with the advance from 30-39 to 40-49 years ( $P < 0.01$ ) and from 40-49 to 50-59 years ( $P < 0.01$ ).

It can be concluded that, while there is definite IHD in 1 man out of 100 at the age of 20-29 years and possible IHD in 2, at the age of 60-69 years definite

Table 1.  
Incidence of IHD as a function of age

Age group	Incidence, %				
	MI	tension angina	pain-free form	possible IHD on EKG basis	history of MI
20-29 years	—	0,8	—	2,3	—
30-39 "	0,3	1,7	—	3,0	0,3
40-49 "	0,9	4,9	0,8	3,0	4,1
50-59 "	2,7	13,3	2,0	6,5	5,7
60-69 "	3,8	18,2	2,5	6,7	6,1
Age-standardized incidence in 20-69-year-old population	0,9	4,7	0,8	3,5	2,0

IHD is already present in every 4th male at 60-69 years of age and possible IHD in every 10th. On the whole, in the 20-69-year-old population, 6 out of 100 males have definite IHD and the same number have possible IHD. Age-standardized incidence of IHD according to expanded criteria constituted 11.9%, i.e., definite or possible IHD was present in about every 10th male 20-69 years of age.

The age-related changes in incidence of different forms of IHD were analogous.

About 1 out of every 100 men 20-69 years of age had definite MI, 4-5 had tension angina, 1 the painless form of IHD, 3-4 possible IHD according to EKG findings and 2 a history of MI.

Table 2.  
Distribution of number of risk factors in different age decades among male population 20-69 years old

Age group	Number of risk factors			
	0	1	2	3
	incidence, %			
20-29 years	23	60	14	3
P	>0,1	<0,02	<0,05	<0,05
30-39 "	27	46	20	7
P	>0,1	>0,05	>0,05	<0,05
40-49 "	24	41	24	11
P	<0,02	>0,1	<0,05	>0,05
50-59 "	19	41	27	13
P	>0,05	>0,1	>0,1	<0,05
60-69 "	23	41	27	9
Age-standardized incidence in 20-69-year old population	23	49	20	8

There was not a single case of definite MI, painless form of IHD or history of MI at the age of 20-29 years; tension angina was encountered in 1 out of 100 males, while possible IHD on the basis of EKG data was found in 2.

Up to the age of 60 years, the incidence of definite MI was 3 times higher in each subsequent decade of age, while tension angina pectoris incidence was 2-3 times higher than in the preceding decade. The rates of rise in incidence of other forms of IHD were less stable.

By the age of 60 years, the rise in incidence of various forms of IHD slowed down. At 60-69 years, definite IHD was encountered in 4 men out of 100, tension angina in 18, pain-free form of IHD in 2-3, possible IHD according to EKG data in 7 and history of MI in 6.

The incidence of each form of IHD differed with statistical significance in the extreme age groups--20-29 and 60-69 years ( $P < 0.025$ ).

It is apparent from the data listed in Table 2 that, at the age of 20-69 years, every 4th male did not have IHD risk factors, half the screened men had 1 factor, every 5th had 2 factors and almost every 10th had 3 or more IHD risk factors.

Table 3.  
Share of exogenous and endogenous factors  
(%) in group of subjects with 1 risk factor

Age group	Risk factor	
	exogenous	endogenous
20-29 years	92,5	7,5
$P^*$	<0,005	
30-39 "	79,7	20,3
$P$	<0,01	
40-49 "	70,5	29,5
$P$	<0,01	
50-59 "	56,0	44,0
$P$	<0,02	
60-69 "	44,7	55,3
Age-standardized incidence at 20-69 years	76,8	23,2

\*All  $P$  between consecutive age decades.

the age of 20-29 years to a maximum of 27% at 50-59 years, and in that of males with 3 or more risk factors from 3% at 20-29 years to 13% at 50-59 years.

Thus, while less than 20% of the men had 2 or more risk factors at the age of 20-29 years, by the age of 50 years the figure was already 40%.

There was some decline, though statistically significant, in share of subjects with 3 or more risk factors, to 9%, at the age of 60-69 years. This could be due to higher mortality from IHD at this age among individuals with many risk factors.

The IHD risk factors we studied can be divided into exogenous ones, i.e., those related to the patient's living conditions and life style, as well as his habits (smoking, minimal physical activity), and endogenous ones, which characterize the patient's physiological condition (EW, HCE, AH).

The data in Table 3 indicate that, in 3/4 of all examined men at the age of 20-69 years with 1 risk factor, this factor was exogenous and in only 1/4 it was endogenous.

With age, the incidence of exogenous factors among males with 1 risk factor rapidly declined from 92.5% at 20-29 years to 44.7% at 60-69 years, while that of endogenous ones rose from 7.5% at 20-29 years to 55.3% at 60-69 years. All differences between consecutive age decades were statistically reliable.

Thus, while endogenous factors were encountered in fewer than every 10th male among those with 1 risk factor at the age of 20-29 years, they were present in over half the men in the 60-69-year group.

This can be explained by the fact that, at a younger age, endogenous factors usually develop against the background of exogenous ones, and they are combined

There was little change with age in share of subjects without risk factors, and it remained at 19-27%. Its significant decline occurred in the 4th-5th decade of life, i.e., during the period of highest IHD risk. By the age of 60 years, the share of patients without risk factor increased somewhat again, mainly due to decrease in smokers.

The incidence of 1 risk factor decreased with statistical reliability from 60% at 20-29 years to 40% at 40-69 years. This is also related mainly to decrease in number of smokers.

Concurrently there was a significant increase in share of subjects with 2 risk factors, from 14% at

with the latter. At an elderly age, endogenous factors start to play an independent role and are less dependent on exogenous ones. Moreover, at this age the overall effect of exogenous factors (smoking and low physical activity at a young age, etc.) accumulated in the course of prior life starts to be felt.

Table 4.  
Incidence of IHD as a function of number  
of risk factors in subjects 40-59 years old

Number of risk factors	0	1	2	3	4 or more
Incidence of IHD, % <i>P</i>	11,1 <0,02	7,4 <0,01	12,5 <0,05	17,4 <0,02	28,6

As can be seen in Table 4, the lowest incidence of IHD, 7.4%, was referable to the group with 1 risk factor. Then, with increase in number of risk factors by 1, the incidence of IHD rose to 12.5% with 2 factors, 17.4% with 3 and 28.6% in the group with 4 or more factors, i.e., every 4th subject in this group had definite IHD.

The increase in incidence of IDH with increase by 1 in number of risk factors was statistically significant ( $P < 0.01-0.05$ ).

Interestingly, in the group of subjects without risk factors the incidence of IHD reached 11%, and it was reliably higher ( $P < 0.02$ ) than in the group with 1 risk factor. This is related to the fact that the classical factors considered in determining the degree of risk do not include all indicators affecting development of IHD. These indicators definitely include psychoemotional stability, hereditary factors, diet and hormonal disturbances. Probably the influence of these unconsidered risk factors is what led to the demonstrated relative rise in incidence of IHD among individuals without the classical IHD risk factors.

At the same time, even with consideration of only five classical risk factors, the incidence of IHD depended significantly on their number. It was 3-4 times higher in the group of males 40-59 years old with more than 4 factors than in the group of men of the same age with less than 1 risk factor.

Step-by-step linear regression analysis singled out the following among the group of risk factors: among pairs of indicators--systolic BP and cholesterol level, and among the possible groups--systolic BP, cholesterol and triglyceride levels. Different combinations of the latter could lead to the same association with IHD. However, concurrent drastic elevation of systolic pressure and lipid levels had the strongest effect on IHD. The factors are in the following order in degree of association with IHD: arterial hypertension, hypercholesterolemia, excessive weight, smoking, low physical activity.

It should be borne in mind that the role of different risk factors is determined not only by the degree of their association with IHD, but incidence of pathological levels for them in the population. Each of the risk factors discussed enhances the effect of the others, as a result of which conditions are created for development of IHD.

The introduced indicator of quantity of risk factors is closely related to incidence of IHD, and its determination is based on a rather simple and practically convenient methodological approach. For this reason, this

indicator can be used in planning and implementing measures for mass-scale IHD prevention over a wide range of ages.

### Conclusions

1. The incidence of IHD and its main forms depends substantially on age. The incidence of definite IHD rose from 0.8% in subjects 20-29 years old to 24.5% at 60-69 years, while the incidence of possible IHD rose from 2.3 to 12.7%. Age-standardized incidence of IHD according to expanded criteria is 11.9%.
2. With age, there is a change in distribution of the main IHD risk factors in the population. The share of patients with many risk factors increases with statistical significance up to the age of 60 years. At 50-59 years of age, 27% of the males have 2 IHD risk factors and 13% have 3 or more. Concurrently, there is decline in share of exogenous factors and rise in share of endogenous ones.
3. The incidence of IHD depends substantially on the number of risk factors: it is 4 times higher in the group of males 40-59 years of age with 4 or 5 risk factors than in the group of the same age with 1 risk factor, and it reaches 29%.

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EPIDEMIOLOGICAL ASPECTS OF ISCHEMIC HEART DISEASE, ARTERIAL HYPERTENSION AND  
ATHEROGENIC CHANGES IN BLOOD LIPID COMPOSITION IN LENINGRAD MEN AND WOMEN  
20-69 YEARS OF AGE

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[Article by B. M. Lipovetskiy, D. B. Shestov, S. I. Plavinskaya, V. O. Konstantinov, G. N. Il'ina, A. G. Katrushenko, V. F. Tryufanov, V. P. Khoptyar and L. I. Virkovskaya, Laboratory for Population Studies of Atherosclerosis (chief--Docent D. B. Shestov) of Department of Biochemistry (headed by A. N. Klimov, Academician of the USSR Academy of Medical Sciences), Scientific Research Institute of Experimental Medicine, USSR Academy of Medical Sciences, Leningrad]

[Text] In the last 10 years, quite a few works have been published in the Soviet literature dealing with epidemiology of IHD [ischemic heart disease] and its main risk factors [2, 4, 6 and others]. However, virtually all of them were based on studies of a sample of the male population 40-59 years of age.

Our objective here was to assess the incidence of IHD and its prime risk factors by the method of simultaneous screening not only of men, but women 20 to 69 years of age.

All of the studies were conducted on an unorganized population, residents of Petrogradskiy Rayon in Leningrad. The selection for epidemiological screening of the public was made from tables of random numbers [2]. Actual screening for each sample constituted at least 72% of the selected subjects included in the initially formed population. The response obtained conformed to the rules of epidemiological studies. In all, 6752 people underwent screening, including 4528 men and 2224 women. All of the methods used in our work (WHO questionnaire for detection of tension angina pectoris, measurement of BP, evaluation of resting EKG by the Minnesota coding system, biochemical assay of blood lipid panel) were strictly standardized [2].

Individuals with definite myocardial infarction (codes 1-1, 1-2), tension angina (according to the strict criteria of the WHO questionnaire), as well as with its pain-free forms, in the presence of which without angina pectoris any of the following categories of the Minnesota code were demonstrable on the EKG: 1-3; 4-1, 2, 3, 4; 5-1, 2, 3; 6-1, 2; 7-1; 8-3, were considered to be ill.

Table 1. Incidence of detection of IHD in men (4528) and women (2224) according to simultaneous epidemiological screening (% of number screened)

Incidence of different forms of IHD	Age, years							
	20-29		30-39		40-49		50-59	
	m (317)	f (273)	m (315)	f (420)	m (2199)	f (615)	m (1419)	f (573)
Myocardial infarction	—	—	0.6	—	1.0	0.5*	2.5	—
Angina combined with "ischemic" EKG codes	—	—	—	0.2	0.8	0.5	2.1	2.8
Angina without "ischemic" EKG changes	—	0.7	2.3	1.4	4.3	5.7	7.6	7.3
Pain-free IHD (according to EKG data)	0.6	2.2	1.9	3.1	2.9	3.4	5.9	9.8*
Totals	0.6	2.9*	4.8	4.7	8.9	10.1	18.0	20.5
							28.3	33.3

Note: Here and in Tables 2 and 4 number of subjects screened is given in parentheses.

\*Reliable differences ( $p < 0.05$ ) between men and women in a given age group in incidence of detection of IHD and its different forms.

Table 1 lists the incidence of IHD among men and women in 5 age groups (3d, 4th, 5th, 6th, 7th decades of life), and it shows a distinct increase in number of IHD cases with advance in age. Up to the age of 40 years, the incidence of IHD among men and women does not exceed 4.8%, at 40-49 years it increases by almost double, in the next decade it rises to 18.0-20.5% and reaches 28.3-33.3% in subjects 60-69 years old. A comparison of incidence of IHD among males 40-49 years old (8.3%) and 50-59 years old (21.7%) in Moscow [6] to the figures for Leningrad failed to demonstrate appreciable differences in these age groups.

Contrary to our expectations, we failed to establish a significant difference between overall incidence of IHD in men and women in the 4 age decades over 30 years old. The incidence of IHD was higher in women only among those 20-29 years of age. Definite evidence of prior myocardial infarction were noted more often among males than females (the differences were reliable in the population 40-49 years of age); the tension angina syndrome was demonstrated equally often, while painless forms of IHD were overtly more frequent in women (differences are reliable at 50-59 years of age).

Since it was impossible to rule out a nonspecific genesis for most EKG changes, we analyzed overall incidence of IHD in the male and female populations according to only the 2 most reliable criteria: 1-1, 1-2 (definite myocardial infarction) according to EKG codes. and results of WHO questionnaire for detection of tension angina pectoris. With this approach, the incidence of IHD was in the

range of 0-2.9% among males 20-29 and 30-39 years of age, 10.1-11.9% among men 50-59 and 60-69 years of age; among women, an analogous approach enabled us to find that incidence of IHD was 0.7-1.4% in populations 20-29 and 30-39 years old, 7.8-11.1% in those 50-59 and 60-69 years of age. These comparisons indicate, once more, that it was not possible to establish appreciable differences in incidence of IHD between males and females. Still, when analyzing these data, some caution is necessary, since the specificity of the questionnaire method for detection of tension angina pectoris is not necessarily the same in women as in men, i.e., it may be lower. This would lead to an increase in false-positive data concerning cases of tension angina in the female population, which would artificially raise the incidence of IHD among them. Drawing parallels with the results of coronarography in men and women is one of the means of defining the specificity of the questionnaire method for detection of tension angina.

Table 2.

Incidence of AH in male and female populations of Leningrad 20-69 years of age (% of number examined)

Age, years	Sex and number of subjects	Blood pressure		
		normal	border-line	high
20-29	m (318)	80.8	9.7**	9.4**
	f (273)	91.9	4.4	3.7
30-39	m (315)	67.9*	14.0	18.1* **
	f (420)	81.4*	10.5*	8.1*
40-49	m (2321)	45.7*	19.1*	35.1* **
	f (615)	60.2*	16.7*	23.1*
50-59	m (1419)	32.5*	22.3*	45.1*
	f (572)	29.9*	21.0	49.1*
60-69	m (277)	24.9*	24.2	50.9
	f (336)	17.3*	25.6	57.1*

\*Reliable differences between men and women in adjacent decades of age in incidence of cases with indicated BP

\*\*Reliable differences in incidence of cases with borderline BP or arterial hypertension between men and women in the same age groups

Table 3.

Incidence of IHD (%) in male and female population 20-69 years of age with different blood pressure levels (number of individuals with indicated BP given in parentheses)

Age, years	Sex	BP		
		normal	borderline	high
20-29	m	0.8% (256)	— (33)	— (26)
	f	2.8% (251)	— (12)	10.0% (10)
30-39	m	4.2% (216)	4.5% (44)	7.3% (55)
	f	3.8% (342)	2.3% (44)	17.6%* (34)
40-49	m	6.5% (1077)	9.7% (452)	12.1%* (785)
	f	7.3% (370)	12.6% (103)	15.5%* (132)
50-59	m	12.9% (503)	17.2% (355)	22.7%* (225)
	f	19.3% (171)	18.3% (120)	23.1%* (281)
60-69	m	19.7% (61)	31.4%* (70)	32.8%* (137)
	f	19.6% (58)	31.4%* (86)	36.5%* (192)

\*Statistically reliable difference ( $P < 0.05$ ) in incidence of IHD between group with indicated BP and group of the same age and sex with normal BP

We also examined the incidence of the most significant EKG codes that give sufficient grounds to suspect chronic

coronary insufficiency (4-1, 2, 3; 5-1, 2). We found that these categories distinctly prevailed in women of all age groups. Thus, the incidence of detection of this group in the 5 decades of life constituted 1.8, 1.0, 1.3, 5.1 and 9.0%, respectively, versus 0, 0.3, 1.0, 2.6 and 4.7% for males. Thus, definite myocardial infarction was more often demonstrated in the male population, while marked chronic coronary insufficiency, according to EKG data, was found more among females. In addition, it is known that electrolyte and dyshormonal metabolic disturbances in the myocardium, which are reflected on the EKG, are more inherent in women. As for the incidence of severe hypertrophy of the left ventricle (codes 3-1 or 3-3 combined with 4-1, 2, 3), which could be associated

with coronary insufficiency or simulate [typo for stimulate?] it, the incidence of such changes was virtually the same in men and women over 50 years of age (2.0 and 1.9% in males and females 50-59 years old; 3.6 and 3.5% in males and females 60-69 years old).

Incidence of arterial hypertension (AH) among different age groups is quite important. We distinguished 3 groups of subjects in accordance with the classification adopted by WHO into normal (up to 140/90 mm Hg), borderline (140/90-159/94 mm Hg) and high BP (at least 160/95 mm Hg). Table 2 shows that the incidence of AH rises significantly with age (from 9.4 to 50.9% in men and 3.7 to 57.1% in women, according to our findings). There are grounds to believe that the incidence of AH is higher in Leningrad than, for example, in Moscow or Kiev. According to the data of I. K. Shkhvatsabaya et al. [6], the incidence of AH in Moscow was 13.6% in men 40-49 years of age and 26.2% in men 50-59 years old; in Kiev [5], its incidence was 22.1% in the male population 40-49 years old.

Interestingly, according to our observations, the incidence of AH was higher in men up to 50 years old than in women; after the age of 50 years, AH starts to be demonstrable in women somewhat more often. The same trend is seen with respect to borderline BP level. Analysis of the effect of BP on incidence of IHD in males of different age groups showed that there is a tendency toward rise in incidence of IHD among individuals with AH (Table 3). This tendency acquires statistical significance in male populations 40-49, 50-59 and 60-69 years of age. In women, the incidence of IHD also rises with AH, and this is statistically reliable (as compared to the group of subjects without AH) in the populations 30-39, 40-49 and 60-69 years of age. Relevance of borderline BP in the sense of increased incidence of IHD is manifested only in the older age groups, in both men and women. Thus, the incidence of diagnosing IHD rises from 19.7% among men with normal BP at 60-69 years of age to 31.4% among those with borderline BP; an analogous rise is demonstrable in women of the same age, from 19.6 to 31.4%.

Epidemiological screening of the population, which included blood lipid assay, enabled us to construct a statistical series of distributions of lipid levels for each of the lipid parameters, and to single out 4 quartiles in each such series: bottom, 2 intermediate and top. The bottom range of the 4 quartiles in statistical series of total cholesterol (CS) and triglyceride (TG) levels, as well as coefficient of atherogenicity ([3], reflects the ratio of atherogenic lipoprotein content to antiatherogenic lipoprotein levels) and the top range of the first quartile for  $\alpha$ -lipoprotein cholesterol ( $\alpha$ -CS) could give an idea of the extent to which an atherogenic shift of blood lipid spectrum is manifested in a given population.

Total CS level, which determines the bottom range of the 4th quartile, is higher among men 30-39 and 40-49 years old than in women of the same age (6.0 and 6.3 mmol/l, versus 5.5 and 6.0 mmol/l). After the age of 50 years, CS level rises significantly in women and starts to be clearly higher than in men (6.8-6.9 mmol/l, versus 6.3-6.4 mmol/l). Approximately the same age-related dynamics in populations can be noted with regard to TG. As for the values of  $\alpha$ -CS determining the top of the 1st quartile, they remain stably low in men of all age groups (1.14-1.09 mmol/l), as compared to women (1.24-1.37 mmol/l). A comparison of lipid indicators in blood of men and women

shows that there are particularly wide differences in the atherogenicity coefficient. Thus, the bottom range of the 4th quartile for this indicator equals 4.05 relative units for men 30-49 years of age, whereas in women such a relatively high value for its bottom range (4.1 relative units) appears only in the population 60-69 years old. In younger female populations (30-59 years), the coefficient of atherogenicity determining the 4th quartile of its values is much lower (2.63-3.81 relative units).

Table 4. Incidence of IHD in 1st and 4th quartiles of statistical series of blood lipid values in men and women over 30 years of age in different age decades (% of number screened of the same age and sex contained in the 1st or 4th quartile for a given lipid parameter)

Age, years	Sex	Total CS		TG		$\alpha$ -CS		Atherogenicity coefficient	
		1	4	1	4	1	4	1	4
30-39	m (315)	2,4	9,3	3,7	8,9	1,5	8,0	5,3	5,3
	f (420)	4,9	8,0	3,7	5,3	5,7	6,5	4,0	7,8
40-49	m (2199)	7,9	11,6*	6,0	13,2*	13,9	5,3	4,7	13,6*
	f (615)	9,2	11,1	6,5	14,9*	11,3	8,4	8,6	11,5
50-59	m (1419)	14,4	24,7	16,2	23,3*	21,1	12,9	11,7	23,1
	f (573)	19,7	24,8	13,3	34,3	33,3	12,4	14,1	32,1
60-69	m (273)	24,7	31,6	25,0	41,2*	35,7	21,2	19,4	35,3*
	f (343)	33,3	40,2	30,7	41,5	34,9	31,7	28,6	40,8

\*Reliable differences ( $P < 0.05$ ) in incidence of IHD between 1st and 4th quartiles in subjects of given age and sex.

In order to determine how blood lipid levels affect incidence of IHD in the populations, we analyzed the relation between incidence of detection of IHD in the 1st and 4th quartiles for each lipid parameter. These data are listed in Table 4. After the age of 30 years, men show a tendency toward rise in incidence of detection of IHD in the 4th quartile of blood CS values, as compared to the 1st quartile, reaching statistical significance in populations 40-49 (11.6, versus 7.9%) and 50-59 years old (24.7, versus 14.4%). In women, there is also a tendency toward increased detection of IHD in the 4th quartile of total CS values, as compared to the first quartile, but it did not reach a reliable difference in any of the age groups.

Differentiated analysis of incidence of IHD in the 1st and 4th quartiles of TG values of blood showed a reliable increase in percentage of IHD cases in the 4th quartile of distribution in men 40-49, 50-59 and 60-69 years of age, as well as in women 40-49 and 50-59 years old.

Evaluation of incidence of IHD in groups with different blood  $\alpha$ -CS levels showed that it rose with low  $\alpha$ -CS level only in women 50-59 years of age.

A comparison of IHD incidence among subjects with lower (1st quartile) and higher (4th quartile) atherogenicity coefficient enabled us to demonstrate an IHD rise in the 4th quartile of the statistical series in men 40-49 and 60-69 years old and in women 50-59 years of age.

Thus, we found the most distinct relationship between an atherogenic shift in the lipid spectrum of blood and increase in IHD in men 40-49 years of age

(according to total CS, TG and atherogenicity coefficient), men 50-59 years old (total CS and TG) and men 60-69 years old (TG and atherogenicity coefficient). In women, an appreciable increase in IHD detection in connection with an atherogenic shift in blood lipid fractions was established only in the 50-59-year population (TG,  $\alpha$ -CS, coefficient of atherogenicity).

TG contributed to equal extent in men and women to increase in incidence of IHD, and among individuals 60-69 years of age, even a borderline BP level raised the incidence of detection of IHD.

This investigation did not enable us to demonstrate the so-called paradox in epidemiology of IHD, according to which the incidence of IHD is lower in men 50-59 years old with AH and hypercholesterolemia than in individuals without these risk factors (I. K. Shkhvatsabaya et al.). Our observations revealed that presence of AH and an atherogenic shift of blood lipid spectrum in individuals 50-59 and 60-69 years of age is instrumental in increasing the incidence of associations with IHD. This also conforms with the experimental findings of N. N. Gorev et al. [1], according to whom AH and hypercholesterolemia in old rabbits elicits more severe atherosclerotic changes in the aorta than in young animals.

#### Conclusions

1. IHD is equally distributed among men and women in an unorganized population of Leningrad 30-69 years of age; the incidence of IHD rises from 4.7-4.8% (in individuals 30-39 years old) to 28.3-33.2% (60-69 years of age); however, there is a higher percentage of definite myocardial infarction among men than women.
2. The incidence of arterial hypertension (AH) is higher among men 20-49 years old (9.4-35.1%) than in women of the same age group (3.7-23.1%). After the age of 50 years, the incidence of AH in the female population rises somewhat (49.1-57.1, versus 45.1-50.9%). AH is instrumental in increasing the incidence of IHD, particularly in the older age groups.
3. An atherogenic shift of blood lipid spectrum is observed in the male population over 30 years of age, which affects the increase in incidence of IHD in men over 40 years of age. An atherogenic shift is demonstrable in the female population after the age of 50 years, leading to increase in frequency of diagnosing IHD at that age.

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# HEMODYNAMIC CHANGES IN PRESENCE OF OVERT AND ABORTIVE FORMS OF DELIRIUM TREMENS

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[Article by I. V. Levenets, Ternopol Medical Institute]

[Text] Signs of impaired cardiac function are always seen in the presence of delirium tremens, the most frequent acute methyl alcoholic psychosis that develops in the withdrawal period in chronic alcoholics: changes in heart rate, in blood pressure and signs of vascular dystonia. The clinical distinctions of functional disturbances in the cardiovascular system associated with delirium tremens, as well as hemodynamic changes already described in the literature, in the presence of chronic alcoholism [1, 4, 6, 9, 16], the existing theories of pathogenesis of alcoholic psychoses and alcoholic myocardiodystrophy suggest that there are serious changes in the systemic circulation of such patients. Such pathogenetic mechanisms, which have been described in the presence of alcoholic myocardiodystrophy, as impairment of energetic and transport processes on the subcellular level, with change in myocardial catecholamine levels [10, 11, 13], imbalance between cholinergic and adrenergic influences in function of the adrenosympathetic system [7, 15], intra- and extracardiac metabolic disturbances [13, 14] could be closely linked with the pathogenetic elements of delirium tremens itself. Heretofore, no studies had been made of the mechanisms of hemodynamic changes associated with delirium tremens and their relation to the clinical variants of this psychosis. We were unable to find any information about this in the literature.

We examined 53 men in a state of delirium tremens (average age 38.3 years) in order to investigate circulatory distinctions. The results of examining 18 essentially healthy subjects (average age 37.8 years) served as a control. In addition, we made comparisons to analogous hemodynamic parameters of 8 patients of the same age with nonpsychotic forms of alcoholic withdrawal. Clinical stage II alcoholism was diagnosed in 80% of the subjects and stage III in 20%. The subjects were divided into three groups. The 1st group consisted of 27 patients with clinical signs of fullfledged delirium tremens, with typical sleep disorders, perceptual illusions, psychomotor excitement, delirium reflecting the nature of hallucinations, orientation disorders, etc. The 2d group consisted of 26 patients with reduced psychotic symptoms of abortive psychosis. The 3d group consisted of 8 patients with nonpsychotic forms of alcohol withdrawal symptoms. Overt delirium tremens was present in 21 patients of the 1st group, lasting 3-5 days, and in 6 of them it was of the

protracted, agitated [or exaggerated] type. The parameters of central hemodynamics of these patients, as well as 18 in the 2d group, could be studied only by the dye-dilution method. In the other cases, hemodynamic parameters were measured by the impedance method of tetrapolar rheography. This noninvasive method, which facilitates the tests, was also used in 6 out of the 27 cases of overt delirium with mild and moderate course lasting 2-3 days, i.e., when it was possible to obtain a good enough polycardiographic tracing. We performed the instrumentation studies on patients with psychomotor excitement during "lucid" intervals in their mental state and with heightened suggestibility.

A neutral dye, Evans blue (T-1824) was injected in the blood stream to examine central hemodynamics by the dilution method of Stuart-Hamilton [12]. The dilution curve was recorded on an oxyhemograph by means of an ear sensor. Dye concentration in blood serum was measured photometrically. We calculated the cardiac index (CI), specific peripheral vascular resistance (SPVR), determined heart rate (HR), mean dynamic arterial pressure (MDBP), hematocrit (HC) and globular volume (GV), i.e., parameters that make it possible to level off to a maximum extent the influence of individual anthropometric distinctions of the subjects on statistical results of the studies.

In determining cardiac output by the method of tetrapolar thoracic rheography [3], we recorded the base impedance found using an RPG-202 rheoplethysmograph, basic and differential rheogram, and we also recorded the PKG [phonocardiogram] and EKG. We determined stroke volume, calculated the CI and SPVR from the polycardiogram data. In the study of regional circulation, we used impedance measurements [2, 5] to determine specific central blood volume (CBV) with consideration of the perimeter of the chest and specific peripheral blood volume (PBV) with consideration of perimeter of the lower leg, pulsed arterial filling of the limb (PF) in the tested part of the leg.

We re-examined the patients within 7-14 days after curbing the psychosis and disappearance of main autonomic disorders; in 6 cases of overt delirium with mild and moderate course, we succeeded in using tetrapolar rheography in the process of curbing the psychosis at the height of action of drugs.

Data obtained by both methods were entirely comparable, since the results differed unreliably in control measurements. Among the tested patients with alcoholism, there were none with marked signs of ischemic heart disease, arterial hypertension, history of organic myocardial lesion, and there were also no other intercurrent diseases.

Substantial central hemodynamic disturbances were demonstrated in all cases of delirium tremens (Table 1). There was reliable increase in HR and MDBP, HR changes being the most marked ( $116.4 \pm 2.4/\text{min}$ ) in patients of the first group with clinical signs of severe forms of overt classical and agitated type of delirium. There was no reliable difference between first and second groups of patients with regard to elevation of MDBP ( $109.0 \pm 1.1$  and  $105.6 \pm 1.2$  mm Hg, versus  $95.0 \pm 1.1$  mm Hg in the control). CI was low in the first group ( $3.2 \pm 0.2$  l/min/m<sup>2</sup>, versus  $4.5 \pm 0.3$  l/min/m<sup>2</sup> in the control group). The lowest CI values were found in the first group of patients with severe agitated delirium tremens ( $2.7$  l/min/m<sup>2</sup>). The deviations of this parameter from normal were unreliable in the second group. Evidently, this general finding in this group could be

attributed to the fact that there were some individuals with high CI (up to 6.0-7.4 l/min/m<sup>2</sup>) and low SPVR among patients with abortive delirium, with normal and low CI in the presence of normal and high SPVR (normokinetic and hypokinetic types of circulation). This could be interpreted as manifestations of hyperkinetic type of circulation. SPVR (ratio of MDBP to CI), which largely determines blood pressure level and characterizes the condition of the vascular bed, was considerably elevated in cases of severe delirium ( $34.2 \pm 0.7$  arbitrary units, versus  $22.1 \pm 0.7$  arbitrary units in the control). In such cases, SPVR was reliably higher than in patients of the second group.

In the case of overt delirium with mild and moderately severe course (Table 2), HR, MDBP and CI were reliably elevated, with low SPVR, i.e., there were signs of hyperkinetic circulation. In the course of treating the psychosis at the height of effects of drugs, when patients developed therapeutic drug-induced sleep after intravenous injection of aminazine and magnesium sulfate in the same syringe [8], administration of pyroxan, corglykon, seduxen, thiol compounds and vitamins of the B group, we observed reliable decline of HR, MDBP and SPVR, with some increase of CI. All six patients of this group came out of their psychotic state readily, immediately after critical sleep. Such a marked therapeutic response to the drug combinations given could apparently be attributed to the beneficial combination of sedative and adrenolytic effects of aminazine and pyroxan, which have the properties of  $\alpha$ -adrenoblocking agents. Other authors have previously reported increase in cardiac output, decreased oxygen requirement of the myocardium and diminished peripheral resistance after intake of aminazine [17].

After disappearance of the psychotic state and for another 7-14 days, when the patients in this group already showed normal HR and MDBP, high CI and low SPVR still persisted. In the other patient groups, the circulatory parameters studied had essentially reverted to normal at this time.

In the third group of patients, with nonpsychotic forms of withdrawal symptoms, which developed a few days after alcohol abuse, the changes in HR and MDBP were not as significant as in the first and second groups. CI and SPVR deviated from normal beyond the limits of reliability, although SPVR was reliably greater than in the first group of patients. HC and GV (ratio of difference in circulating blood mass and circulating plasma to patient's weight), which reflect the state of volemic processes, demonstrated unreliable changes.

Values for CBV, PBV and PF did not differ from those for the healthy subjects in the control group.

Thus, our studies revealed significant decline of CI with concurrent elevation of HR, MDBP and SPVR in the first group of patients with severe forms of overt and chronic delirium tremens. This combination of hemodynamic parameters is indicative of hypokinetic type of circulation and impairment of myocardial contractile function. The opposite findings were inherent in patients of the first group with mild and moderately severe, brief and favorable course of overt delirium tremens: with elevated HR and MDBP, we observed decline of SPVR and increase of CI, i.e., hyperkinetic type of circulation developing as a result of marked hyperadrenergia. This is confirmed by the efficacy of using  $\alpha$ -adrenoblocking agents in the above-mentioned cases. With the abortive form of delirium

Table 1. Central hemodynamic parameters with overt and abortive forms of delirium tremens (M±m)

Hemodynamic parameters	Healthy subjects (n = 10)	Patients with delirium tremens				
		severe forms of overt delirium (n = 21)	abortive delirium (n = 18)	P	P <sub>1</sub>	7th-14th day after curbing psychosis (n = 14)
HR/min	77.0±0.8	116.4±2.4	98.1±2.7	<0.001	<0.001	75.0±1.0
MDBP, mm Hg	95.0±1.1	109.0±1.1	105.6±1.2	<0.001	<0.001	96.0±0.6
CI, l/min/m <sup>2</sup>	4.3±0.3	3.2±0.2	3.9±0.3	<0.02	—	4.1±0.2
SPVR, arbitr. units	22.1±0.7	34.2±0.7	28.1±0.6	<0.001	<0.001	23.4±0.5
HC	47.8±0.4	48.0±0.3	47.2±0.4	—	—	47.5±0.3
GV, ml/kg	29.4±0.4	28.9±0.4	29.0±0.4	—	—	29.1±0.3

P) reliability of differences from control parameters

P<sub>1</sub>) reliability of differences from parameters for severe forms of overt delirium

Table 2. Changes in hemodynamic parameters of patients with delirium tremens and withdrawal symptoms (M±m)

Hemodynamic parameters	Healthy (n = 8)	Alcoholic patients (delirium, withdrawal)					
		overt delirium (n=6)		abortive delirium (n=8)		withdrawal (n=8)	
		height of clinical manifestations	during treatment	after psychosis	height of clinical manifestations	after psychosis	height of clinical manifestations
HR, per minute	72.0±2.7	95.5±1.2 <0.001	88.8±3.4 <0.01 ≥0.05	64.8±3.3	88.3±4.4 <0.01	73.8±1.1	85.5±2.3 <0.01 <0.01
MBP, mm Hg	95.1±1.4	105.5±2.0 <0.001	100.5±2.0 <0.05	97.9±0.9	105.0±1.6 <0.001	95.8±0.9	104.6±4.4 ≥0.05
CI, l/min/m <sup>2</sup>	4.2±0.3	5.7±0.6 <0.05	6.4±0.5 <0.01	5.9±0.1 <0.05	4.9±0.6 <0.05	6.0±0.8 ≥0.05	4.0±0.8
SPVR, arbitrary units	24.3±1.6	19.2±1.6 <0.05	14.2±1.1 <0.001	16.6±0.2 <0.001	23.1±5.9 <0.05	19.5±4.4 ≥0.05	23.3±1.5
CBV, ml/100 g	14.2±0.7	14.4±0.94	14.0±1.0	16.1±0.9	14.4±1.2	13.8±0.8	14.2±0.9
PBV, ml/100 g	6.2±0.6	7.0±1.1	6.4±0.2	7.4±0.8	6.1±0.5	6.8±0.3	7.0±0.2
PF, ml	4.7±0.9	5.2±1.0	5.6±1.5	3.9±0.4	3.5±0.4	6.3±0.8	5.6±0.6

P<sub>1</sub>) reliability of differences from healthy subjects

P<sub>2</sub>) with overt delirium at height of clinical manifestations

tremens and nonpsychotic forms of withdrawal symptoms, the fluctuations of CI and SPVR were close to the normal range on the average, in spite of elevation of HR and MDVP. This is indicative of greater preservation of compensatory capacities of central circulation in patients with this variant of psychosis.

The results of studying volemic indicators (GV, HC) and regional arterial blood flow (CBV, PBV, PF) revealed that these processes do not play a significant role in the genesis of hemodynamic changes associated with the pathology under study. Yet, it is apparent that the main hemodynamic changes associated with different forms of delirium tremens take place due to change in myocardial contractility and disturbances referable to mechanisms that regulate vascular tonus. The typological nature of these changes was closely related to distinctions of clinical manifestations and course of the studied forms of delirium tremens. In 42% of the patients studied, during the period of asthenization after psychosis, we observed cardialgia and EKG changes that are inherent in alcoholic myocardiopathy, and in 21% of the cases these signs were demonstrated for the first time in their lives. Their severity and duration were more significant in those who had a history of alcoholic psychosis. By the end of the course of specific therapy of alcoholic psychosis, general fortifying and symptomatic treatment, when the main hemodynamic parameters reverted to normal, these signs disappeared in most patients.

It can be assumed that the results we have submitted here of studies of central circulation could serve as the basis for developing new, differentiated and pathogenetically validated methods of curbing various forms of delirium tremens, with consideration of hemodynamic disorders that are observed with it. Evidently, patients with such pathology should be placed under dispensary observation, not only by physicians specializing in drug abuse, but internists and cardiologists.

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STATE OF RENIN-ANGIOTENSIN SYSTEM IN CASES OF SUDDEN CARDIAC DEATH RELATED  
TO DIFFERENT DEGREES OF ALCOHOLIC INTOXICATION

Moscow TERAPEVTICHESKIY ARKHIV in Russian No 4, Apr 84 (manuscript received  
13 May 83) pp 128-132

[Article by V. N. Volkov, R. I. Sokolova and A. M. Vikhert, Department of  
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[Text] Epidemiological and clinical studies of cases of sudden death due  
to heart attack (SCD) revealed that it often occurs against the background of  
varying degrees of alcoholic intoxication. In 25% of the cases, sudden death  
is the immediate consequence of so-called alcoholic cardiomyopathy--ACMP--a  
distinctive process in the myocardium that arises as a result of chronic  
intake of alcohol [1].

It is known that alcohol per se can elicit various hemodynamic disorders. In  
response to these hemodynamic changes, there is automatic triggering of systems  
of regulation and control, the main purpose of which is to maintain an average  
blood pressure and general peripheral vascular resistance. The renin-angiotensin  
system (RAS) is one of these regulatory systems.

Our objective here was to measure renin activity in blood and kidneys in victims  
of sudden death presenting different degrees of alcoholic intoxication and to  
compare the findings to the state of the renal juxtaglomerular apparatus (JGA).  
Our goal was to demonstrate any possible correlations between the state of the  
RAS and severity of circulatory disturbances, which are the basis of acute  
cardiovascular insufficiency in cases of sudden death against a background of  
alcoholic intoxication. We did not find any analogous studies in the available  
literature.

We examined material from 280 men, 24 to 60 years of age, who had died suddenly,  
and in whom death occurred at an exactly established time under extramural  
conditions. We did not include in our processing the cases of sudden death  
with obvious noncardiac causes (thromboembolism of pulmonary artery, brain  
hemorrhages), and in all cases the main pathological diagnosis was coronary  
heart disease in its different manifestations in the form of coronary artery  
thrombosis, myocardial infarction, postinfarction cardiosclerosis, as well as  
ACMP and mixed forms of these two diseases.

Table 1.

PRA and RCRA in cases of sudden death in the presence of blood alcohol (1st group) and without blood alcohol (2d group), as well as in donors (3d group)

Parameter	Group		
	1	2	3
PRA	10,33±0,99* (n=90)	4,89±0,38** (n=190)	2,43±0,14 (n=150)
RCRA	318±16*** (n=85)	267±13 (n=179)	—

\*P<0.001, as compared to parameters in 2d and 3d groups.

\*\*P<0.001, as compared to 3d group.

\*\*\*P<0.02, as compared to 2d group.

Table 2.

PRA and RCRA in SCD cases and living subjects as a function of blood alcohol concentration

Blood alcohol ‰	Victims of SCD		Living
	PRA, ng/ml/h	RCRA, ng/g/h	PRA, ng/ml/h
0,1—2	6,57±0,60*. (n=39)	305±28 (n=37)	—
2,1—6,4	13,2±1,4* (n=51)	327±21 (n=48)	15,01±1,43*** (n=45)
0	4,89±0,38 t (n=190)	267±13** (n=179)	2,42±0,14 (n=150)

\*P<0.001, as compared to individuals without blood alcohol.

\*\*P<0.001 for PRA, P<0.02 for RCRA, as compared to cases of death with blood alcohol (2.1–6.4‰).

\*\*\*P<0.001, as compared to donors.

cation and had sustained slight trauma (bruise, abrasion). Blood was drawn from the ulnar vein.

In addition to measurement of PRA and RCRA, we tested the JGA of 120 victims of sudden death, including 55 who expired with presence of alcohol in blood. For this purpose, pieces of cortical layer of the kidney were fixed in Zenker-formol fixative, imbedded in paraffin and stained by the Bowie method for demonstration of renin granules in JGA cells.

As shown by our studies, PRA was, on the average, twice as high in victims of sudden death with alcohol in their blood than in victims without blood

In 90 cases, death occurred against the background of alcoholic intoxication (first group), no alcohol was demonstrated by gas chromatographic analysis in urine and blood of 190 victims (second group).

Blood for tests was drawn at autopsy from the superior vena cava no later than 6 h after death, and we also took the cortical layer of the kidneys. Blood plasma and renal cortical tissue were frozen and stored at -20°C. Blood plasma and renal cortical layer renin activity (PRA and RCRA, respectively) was measured by the radioimmune method based on the technique described by Cohen et al. [4]. We used the International CIS firm set of reagents. To measure RCRA, we first extracted renin from tissue of the cortical layer of the kidney by the method of Haas et al. [5]. We used a substrate isolated from horse serum as renin substrate in radioimmunological assay of RCRA.

PRA was expressed in nanograms of angiotensin I formed per ml plasma in 1 h of incubation at 37°C (ng/ml/h). RCRA was expressed in nanograms of angiotensin I formed from substrate of horse serum under the effect of renin isolated per gram renal cortex tissue (ng/g/h).

To compare PRA changes in cases of sudden death, we measured PRA of 150 living donors (3d group) and 45 subjects admitted to the department of specialized trauma, who were in a state of moderate and severe intoxication and had sustained slight trauma (bruise, abrasion). Blood was drawn from

Table 3. PRA in cases of SCD as a function of blood alcohol concentration

Parameter	Blood alcohol concentration, ‰					
	0	0.1-1	1.1-2	2.1-3	3.1-4	4.1-5
PRA, ng/ml/h Number of cases P	4.89±0.38 190 —	6.20±0.74 29 >0.1	7.75±1.4 10 >0.05	12.5±1.7 10 <0.001	14.0±4.07 12 <0.05	13.0±1.79 21 <0.001
						13.3±1.77 8 <0.001

P) reliability of differences in indicators for death victims with and without presence of alcohol in blood

alcohol (Table 1) and 4 times higher than PRA in healthy donors.

PRA of living subjects in a state of alcoholic intoxication was also considerably higher than in donors. It should be noted that PRA of living subjects and victims of SCD was similar when alcohol was present in blood (Table 2). RCRA in victims of death against the background of alcoholic intoxication was also higher than mean RCRA for victims of sudden death without alcohol in the blood (see Table 1).

Analysis of all cases of SCD that occurred in the presence of alcoholic intoxication revealed some relationship between blood alcohol level and PRA: PRA rose insignificantly with blood alcohol levels up to 2‰; it increased drastically with levels in excess of 2‰, and changed little thereafter with subsequent rise of blood alcohol level (Table 3). For this reason, we divided all cases of SCD associated with alcoholic intoxication into two groups: the first consisted of cases of sudden death with blood alcohol level not exceeding 2‰ and the second, above 2‰. The results listed in Table 2 show that both PRA and RCRA depend on blood alcohol concentration: the higher the alcohol level in blood, the higher PRA and RCRA, as compared to the same parameters for individuals in whose blood no alcohol was demonstrable.

It is noted in the modern literature that all healthy people can be divided into 3 groups, according to PRA: 1st--with subnormal renin activity (up to 1 ng/ml/h), 2d--with normal activity (5-6 ng/ml/h) and 3d--with high activity (over 6 ng/ml/h) [2, 3, 6].

Our studies revealed appreciable differences in the correlation between these three groups among individuals with and without alcoholic intoxication. While there was prevalence of normal PRA values in cases of SCD with no alcohol in blood and in donors, among victims of death with

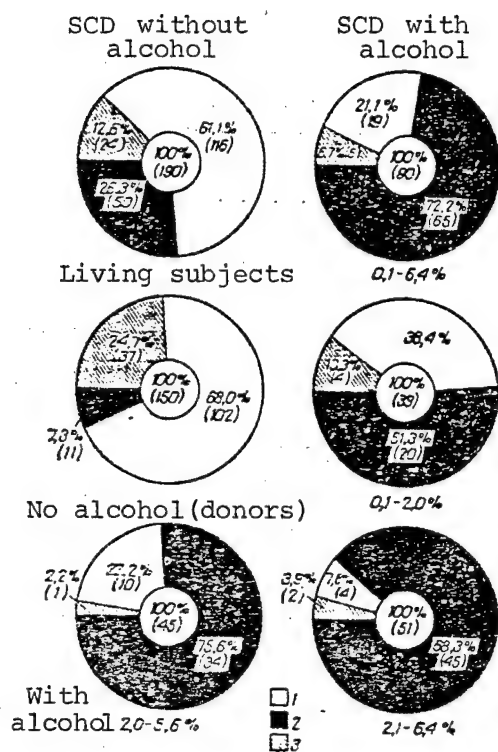


Figure 1.

Normal, high and subnormal PRA in living and dead individuals as a function of blood alcohol level

I) normal PRA

II) high

III) subnormal

Number of cases given in parentheses.

total number of cells containing granules. There was also an increase in number of lacis cells that formed conglomerates in the hilus of the glomerulus. There was distinct demonstration of the structure of m. densa (Figure 26, e).

In the second group of individuals, also with high PRA, the JGA was different: no hyperplasia of cellular elements was observed, when stained by the Bowie method the epithelioid cells of afferent arterioles showed no specific renin granules which, in the presence of high renin activity in the peripheral circulation, was indicative of acute degranulation of cells due to maximum release of renin reserves (Figure 22).

The extent to which the two types of structural changes in renal JGA, which we demonstrated, reflects duration of effects of alcohol cannot be definitely ascertained. However, we found morphological signs of chronic JGA hyperfunction in the form of hyperplasia of all its elements in the presence of chronic alcoholic intoxication leading to development of ACMP.

alcoholic intoxication and living individuals in a state of alcoholic inebriation there was prevalence of high PRA (Figure 1). It should also be stressed that the percentage of cases of high PRA among victims of sudden death is considerably higher when alcohol is present in blood: in death victims with blood ethanol concentration of up to 2.0‰, it constituted 51.3% and with 2.1-6.4‰ ethanol it was 88.3%. In other words, the higher the blood alcohol level, the less often subnormal and normal PRA are demonstrable.

Examination of JGA of the kidneys in cases of SCD with alcohol in blood revealed two types of changes: in the first group of death victims there were morphological signs of chronic JGA hyperfunction and in the second, the JGA changes were indicative of maximum stimulation of renin release. In the first group, we observed distinct hypertrophy of the JGA consisting of increase in number of both granulated and ungranulated cells. The walls of afferent arterioles of many glomerules consisted of several layers of large polygonal cells with round nucleus and clear cytoplasm (Figure 2a). These cells contained a moderate quantity of dark blue granules representing reserve renin. We were impressed not so much by the increase in cell granulation as by the increase in

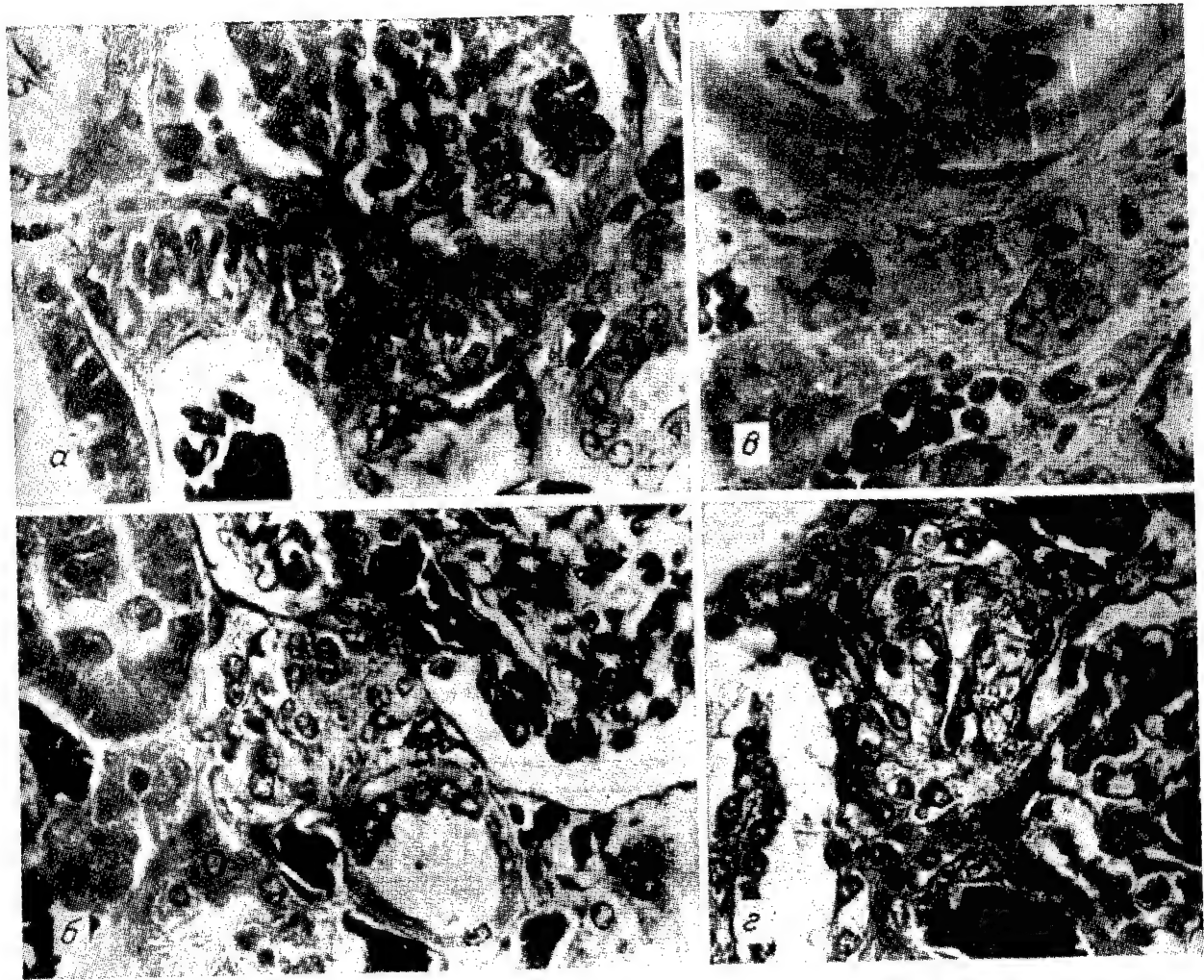


Figure 2. Condition of renal JGA in cases of SCD against the background of alcoholic intoxication. Bowie stain, magnification 700×

- a) hyperplasia and hypertrophy of epithelioid cells of glomerular afferent arteriole
- b) hyperplasia of lacis cells in glomerular hilus, distinct m. densa structure
- e) moderate amount of specific granules in numerous epithelioid cells of JGA
- z) absence of specific granularity in numerous hypertrophied cells of afferent arteriole

We can discuss the results of studying RAS in cases of SCD among victims with different degrees of alcoholic intoxication from the standpoint of role of humoral regulatory factors in the mechanism of sudden death, in the first place, and from the standpoint of direct effect of alcohol on RAS activity, in the second place.

The stimulating effect of alcohol on RAS activity is confirmed by several facts. First of all, it was noted that high PRA is encountered much more often among individuals who expired in a state of alcoholic intoxication than those who died with no alcohol in blood. The highest PRA and signs of chronic JGA hyperfunction were found in individuals with ACMP, i.e., in the presence of a state known to be related to the chronic effect of alcohol.

The relevance of the alcohol factor to change in RAS activity is also clearly demonstrated by the fact that there was increase of PRA with increase in blood alcohol content.

The mechanism of stimulating effect of alcohol on RAS is unclear. Tentatively, one can refer to the significance of increased sympathetic nerve activity, which has been mentioned in the contemporary literature [7, 8], as well as inhibition of antidiuretic hormone by alcohol [9].

The results of our study of the state of RAS in cases of SCD offer an idea about the role of humoral factors in this complicated pathological process. As we know, RAS is a powerful humoral system, the main function of which is to regulate arterial pressure. Obviously, in all pathological situations related to decrease in vascular tonus and blood pressure drop there is a change in activity of the principal parameters of this system. Most probably, the significant increase in PRA in some of the cases of sudden death is due to the acute stimulation of renin discharge from epithelioid cells of the JGA in response to such a powerful stimulating factor as hypotension and decrease in cardiac output. This is confirmed by the acute degranulation of epithelioid cells that we demonstrated. The higher PRA in victims of sudden death with alcoholic intoxication is indicative of additional stimulation not only of discharge, but synthesis of renin. This is confirmed by the distinct morphological signs of chronic JGA hyperfunction, which were found in individuals who consumed alcohol regularly.

## Conclusions

1. In cases of sudden cardiac death where victims expired in a state of alcoholic intoxication, high PRA and RCRA are observed.
2. It was established that there is a direct relationship between blood alcohol level and PRA.
3. In living subjects, PRA is also considerably higher in the presence of blood alcohol than in healthy donors.
4. The high PRA in cases of SCD against the background of alcoholic intoxication is attributable both to increased production of renin and stimulation of its discharge.

5. Hypertrophy and hyperplasia of elements of renal JGA are observed in the presence of chronic alcoholic intoxication.

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TEACHING-EXPERIMENTAL LABORATORY AS FACTOR IN INCREASING  
EFFECTIVENESS OF FIELD SURGERY INSTRUCTION

Moscow ORTOPEDIYA, TRAVMATOLOGIYA I PROTEZIROVANIYE in Russian No 5, May 84  
(manuscript received 19 Apr 83) pp 60-61

[Article by S. P. Karpov, Department of Traumatology and Pediatric Surgery  
(Professor S. P. Karpov, head), Chuvash University, Cheboksary]

[Text] In the process of teaching field surgery it is very important that there be authenticity and the use of visual aids when students are learning how to treat bullet wounds. Since patients with bullet wounds are not encountered frequently in clinics and medical institutions during peacetime, when students are covering these topics they do not gain a clear, graphic idea of the kinds of wounds inflicted by firearms. The concept of a "bullet wound" with all its specific characteristics does not elicit the necessary associations in the minds of students who have never actually seen a bullet wound.

In order to eliminate this deficiency and to optimize instruction in the section of the curriculum that covers bullet wounds, the Department of Traumatology and Pediatric Surgery in the Medical Faculty of Chuvash University set up a teaching-experimental laboratory. The laboratory was organized using the Central Scientific Research Laboratory as a base and it consists of a classroom and an operating room.

The classroom is meant for conducting practical exercises and is equipped with the necessary charts on field surgery. Visual aids, such as instructional tables showing the instruments and medical supplies available at first aid stations, are of great importance. Some of the charts are kept in boxes and shown during the course of the classes, while others are displayed on stands in the classroom. The stands demonstrate the use of a helmet for head injuries, the feldsher's field gear, the medical instructor's bag, and a table of splints for immobilizing extremities.

Thanks to visual aids, students gain a concrete idea of the medical supplies with which battalion aid stations and first aid stations are equipped.

The stand has displays of experimental animals with bullet wounds in the liver, spleen, kidney, lungs, and other organs, which make it possible to see the nature of damage caused by bullet wounds in various tissues.

The operating room is on the same floor and used to to perform instructional operations on animals (dogs) with an assortment of bullet wounds.

#### Methodology of Instruction in the Teaching-Experimental Laboratory

Before the beginning of a class, 2 assisting surgeons, 2 anesthesiologist-resuscitators, and a surgical nurse are selected from the group of students. While these individuals are preparing the animal for surgery, the operating table, the anesthetic equipment, and the system for transfusion of the blood replacements, the instructor and the rest of the group go over theoretical material for 1-1.5 hours in the classroom, using visual aids.

After introduction of hexanal into the animal, the instructor inflicts a bullet wound with a small-caliber pistol into the particular area of the animal's body that corresponds to the topic of the day's class. In the operating room all the students examine the entry and exit wounds caused by the bullet, make a preliminary diagnosis, and recommend the required amount of surgical intervention.

The animal is then placed on the operating table, intubation is performed, anesthesia is given, and anti-shock measures are taken. The instructor and the assistants perform the necessary surgical intervention: thoracotomy, laparocentesis and laparotomy, trephination of the skull or primary surgical treatment of a wound to an extremity.

During such instructional operations on animals, the factor of authenticity and the use of visual aids make a great impression, both educationally and emotionally. The students are convinced of the great destructive force of a 5.6 mm caliber bullet, they see the injured tissues, the wound with the area of necrosis and hemorrhaging, and massive bleeding into the chest or abdominal cavity. The concept of a "bullet wound" becomes absolutely clear to them. They will remember the picture of a bullet wound for a long time.

During the operation the necessary surgical steps are taken, which provide a clear understanding that the amount of surgical intervention needed depends on the nature of the wound to organs and tissues. When the wound is to the chest cavity, a wound in the lung is sutured or resected, a wound to the diaphragm and chest wall is sutured. With wounds to the abdominal cavity, a liver wound is sutured; the wound is packed or part of the liver is resected, the spleen is removed, a stomach wound is sutured, or a loop of the intestine is resected. The instructional operations provide the effect of visual aids and authenticity while the full range of surgical intervention is performed. It is possible to illustrate not only the nature of tissue damage caused by bullet wounds, but also to demonstrate graphically the full range of surgical treatment for bullet wounds.

After the operation the instructor conducts a review of the exercise, devoting attention to errors that were made during the medical treatment and the surgical intervention and discussing possible complications in the future with similar types of wounds.

Our experience shows that the teaching-experimental laboratory can be used to conduct analyses of the following topics:

- bullet wounds to the skull and brain;
- bullet wounds to the chest;
- bullet wounds to the stomach, pelvis, and urogenital system;
- bullet wounds to extremities with bone and joint damage;
- bullet wounds to blood vessels accompanied by hemorrhaging.

A survey at the end of this series of classes shows that all the students have a favorable response to classes of this type and consider them to be very effective graphic demonstrations.

The use of the teaching-experimental laboratory equipped with charts, display stands, and an operating room, makes it possible to provide graphic demonstrations of the primary medical aid provided at first aid stations and the skilled surgical aid provided at medical battalions.

Thus, the use of a teaching-experimental laboratory in covering the section on bullet wounds makes it possible to achieve a high level of effectiveness in teaching field surgery and it creates an atmosphere of authenticity and an approximation of wartime conditions. A recommendation must be made to organize teaching-experimental laboratories at all departments of traumatology and field surgery.

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CSO: 1840/1063

HEMOSORPTION IN TREATING INFECTION AND SEPTIC STATES AFTER SEVERE MECHANICAL TRAUMA

Leningrad VESTNIK KHIRURGII IMENI I. I. GREKOVA in Russian No 5, May 84  
(manuscript received 16 May 83) pp 103-105

DERYABIN, I. I., SHASHKOV, B. V., TRUSOV, A. A. and SUPRUN, T. Yu.,  
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[Abstract] In recent years extracorporeal hemosorption has been used increasingly to treat severe cases of mechanical trauma with subsequent major infections. The Military Field Clinic of the Academy has been involved in many of these cases. The present article is based on those results. Dramatic improvements are reported where wound infections and septic states have been restricted to immediate injuries, and where sepsis diagnoses were confirmed by bacteriological investigation. Where peritonitis had reached severely advanced stages, hemosorption was less successful. Decreases in thrombocytes and leucocytes in the blood have also been observed after hemosorption, along with incidents of subsequent bleeding in 11% of the cases. Thus with its benefits, hemosorption has dangers that must also be considered in determining its use. Overall lethality of the cases amounted to 45%, compared to 68% for control patients (recorded prior to any use of hemosorption). References 6 (Russian).  
[1064-12131]

UDC 577.217

MAINTENANCE OF CELLULAR POLYRIBOSOME PROTEIN SYNTHESIS BY TRANSLATION  
FACTORS FROM ENCEPHALOMYOCARDITIS VIRUS-INFECTED ASCITIC CARCINOMA CELLS

Moscow BIOKHIMIYA in Russian Vol 49, No 4, Apr 84  
(manuscript received 19 Jul 83) pp 629-632

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imeni M. V. Lomonosov

[Abstract] A cell-free system was designed for the in vitro testing of the effectiveness of initiation factors derived from uninfected Krebs-2 cells and cells infected with murine encephalomyocarditis virus. The Krebs-2 cell system demonstrated that translation factors derived from the uninfected and infected cells were equally effective in promoting protein synthesis by polyribosomes containing cellular mRNA. In this respect the encephalomyocarditis virus differs from poliovirus which inhibited translation of cellular mRNA, by stimulating the translation of both the viral and cellular mRNAs. Figures 2; references 8: 3 Russian, 5 Western. [1500-12172]

UDC 577.123

PURIFICATION AND IDENTIFICATION OF INFORMATION RNA OF IMMUNE (GAMMA)  
INTERFERON FROM HUMAN SPLENOCYTES

Moscow BIOKHIMIYA in Russian Vol 48, No 10, Oct 83  
(manuscript received 9 Feb 83) pp 1739-1746

LYAKH, L. A., KHIL'KO, S. N., ASPETOV, R. D., NOSIK, D. N.,  
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[Abstract] Isolation and identification of mRNA of gamma-interferon from splenocytes induced with staphylococcal enterotoxin A(SEA) was described. High RNase activity of splenocyte homogenates complicate isolation of intact

mRNA. Therefore, the following modification was made: the homogenate was cooled with liquid nitrogen and a number of RNase inhibitors was introduced: ribonucleosidevanadyl complexes or a combination of aurin-tricarboxylic acid with dithiothreitol. Separation of cytoplasm was done at  $-10^{\circ}$  C. To obtain preparations free of nonspecific translation inhibitors, chromatography on oligo(dT)cellulose was used along with translation in a cell-free system from rabbit reticulocytes. Human splenocytes mRNA induced with SEA code for the synthesis of biologically active interferon identified as gamma-human interferon. This method allows treatment of large quantities of cells, thus making it a preparatory method suitable for isolation of active mRNA. Figures 1; references 22: 6 Russian, 16 Western.  
[1502-7813]

UDC 577.123

#### INHIBITION OF DNA BIOSYNTHESIS IN SEA URCHIN EMBRYOS BY 2',3'-DIDESOXY-3'-AMINONUCLEOSIDES

Moscow BIOKHIMIYA in Russian Vol 48, No 10, Oct 83  
(manuscript received 10 Feb 83) pp 1747-1751

KUKHANOVA, M. K., KOCHETKOVA, S. V., KRAYEVSKIY, A. A., TEREENT'YEV, L. L. and RASSKAZOV, V. A., Institute of Molecular Biology, USSR Academy of Sciences, Moscow; Pacific Ocean Institute of Bioorganic Chemistry, USSR Academy of Sciences, Vladivostok

[Abstract] Studies are reported of the in vitro effect of 2',3'-didesoxy-3'-aminonucleosides in cellular systems and of their 5'-triphosphates in cell-free systems on biosynthesis of DNA with participation of DNA-dependent eukaryot-DNA-polymerases. The first stage of these studies was carried out on sea urchins. It was shown that 3'-desoxy-3'-aminothymidine and 2',3'-didesoxy-3'-aminoadenosine are effective inhibitors of the biosynthesis of natural nucleosides, specifically of thymidine and 2'-desoxyadenosine at some stage of their conversion to DNA polymerase or during the formation of DNA molecules at replication. The most probable mechanism of this inhibition includes blocking of the template-related polycondensation in which the inhibitors act as analogues of 5'-triphosphates of thymidine and 2'-desoxyadenosine. This inhibition is accompanied by extensive dehydration of the already synthesized DNA. Figures 5; references 8: 1 Russian, 7 Western (3 by Russian authors).  
[1502-7813]

UDC 615.214.22.015.4

SOME PSYCHOTROPIC PROPERTIES OF DERIVATIVES OF PHENOL ETHERS OF BETA-HYDROXY-GAMMA-AMINOPROPANE

Yerevan BIOLOGICHESKIY ZHURNAL ARMENII in Russian No 2, Feb 84  
(manuscript received 23 Jun 83) pp 159-161

SAFRAZBEKYAN, R. R. and PARTER, D. Z., Institute of Fine Organic Chemistry  
imeni A. L. Midzhoyan, Armenian SSR Academy of Sciences

[Abstract] Six compounds (derivatives of phenol ethers of beta-hydroxy, gamma-aminopropane, whose structural formulas are shown in the text) were injected subcutaneously into white mice and white rats in doses of 10 or 100 mg/kg in a study of their psychotropic properties. These derivatives have properties typical of antidepressants. The most pronounced effect was found in compound 1 (see table) in which a tetrahydropyrane ring replaces the piperidine ring. Reactions seen include motor excitation, moderate exophthalmia, temperature reduction, head tremor and moderate catalepsy. Figures 1; references 4 (Russian).  
[1060-2791]

COOPERATION OF SCIENTISTS, PHYSICIANS AND WORKERS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 9 May 84 p 2

SOROKIN, A., first deputy minister, Ministry of Medical Industry

[Abstract] Close cooperation between scientists and production workers is an indispensable prerequisite for the timely mass production of new drugs. This can be successfully achieved when the line workers are introduced to and involved in the research and testing phase of new drugs by the creation of the so-called goal-oriented joint brigades of specialists [TsKBS]. The effectiveness of such team work is best exemplified by the availability of the important cardiovascular agent riboxin and the antineoplastic drug spirobramin. At the present time there are about 30 joint teams working on various drugs. The effectiveness of such collective efforts are indicated by the introduction into mass production of 200 new drugs in the

last Five-Year Plan, and the plans for the additional production of 150 new drugs in the present Plan. In the realization of such team efforts, many practical problems remain to be surmounted, including the allocation of funds and delineation of administrative responsibilities. Lack of appropriate cooperation can be illustrated by the fate of the effective cerebrovascular agent piratsetam: it is presently available in injection form, but the production of adequate quantities of the capsular and tablet forms has yet to be achieved.  
[670-12172]

UDC 591.145:591.181:595.722

# EFFECTS OF SEGESTRIA FLORENTINA SPIDER VENOM ON SYNAPTIC TRANSMISSION IN INSECTS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84  
(manuscript received 12 Jul 83) pp 234-238

MAMATKADIROV, A., DOVZHIKOV, A. A., ZHUKOV, V. V., MANDEL'SHTAM, Yu. Ye. and USMANOV, P. B., Institute of Evolutionary Physiology and Biochemistry imeni I. M. Sechenov, USSR Academy of Sciences, Leningrad; Institute of Biochemistry, Uzbek SSR Academy of Sciences, Tashkent

[Abstract] Venom of the spider *Segestria florentina* was studied for its toxicity on insects, with determinations of synaptic transmission to determine possible mechanism of action. The LD<sub>50</sub> value for the American cockroach *Periplaneta americana* was calculated at 2.2 g/g body weight on intraabdominal administration. Electrophysiological studies on the cholinergic cercal synapses in the cockroach showed that, in sucrose bridge experiments,  $4 \times 10^{-6}$  g/ml toxin concentration decreased the amplitude of interneuron responses by 50-60% after 90-100 min of exposure, while a concentration of  $1-2 \times 10^{-5}$  g/ml resulted in irreversible blockage of synaptic transmission. Studies on glutamatergic neuromuscular synapses in the locust *Locusta migratoria* showed that the toxin increased the frequency of miniature excitatory potentials in a concentration of  $10^{-5}$  g/ml, i.e., exerted a presynaptic effect. These observations indicate the presence of at least two components in the spider venom that have different modes of action on the insect synapses. Figures 4; references 15: 6 Russian, 9 Western.  
[649-12172]

## CHARACTERISTICS OF SUBUNITS OF BOTULIN NEUROTOXIN TYPE A

Moscow BIOKHIMIYA in Russian Vol 49, No 3, Mar 84  
(manuscript received 24 May 83) pp 426-431

VINOGRADOV, I. D., UVADROVA, R. N., BARATOVA, L. A., KAZDOBINA, I. S.,  
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[Abstract] A study of isolation and characteristics of botulin neurotoxin type A subunits, including determination of the amino acid composition of N-terminal amino acid residues and investigation of their serological properties is described and discussed. Heavy and light chains of type A neurotoxins were isolated in homogeneous form with molecular mass of 98,000 and 56,000 DA respectively. An equal level of polar and nonpolar amino acids was found in the heavy and light chains of the neurotoxins but considerable differences in the levels of tryptophan and SH-groups in heavy and light chains are found. The N-terminal amino acid residue of the heavy chain is alanine and 2 N-terminal residues in the neurotoxin are identified as alanine and leucine. Fluorescence spectra of neurotoxin subunits indicate their different conformational state. The light chain of the neurotoxin is the most densely packed part of the molecule and the heavy chain has a more developed spatial structure. Antigenic non-identity of the subunits indicate the presence of at least 2 antigenic determinants in the neurotoxin on the heavy and light chains. Figures 5; references 23:  
4 Russian, 19 Western.  
[1505-2791]

UDC 575.24:599.323.4

## ARSENIC TRIOXIDE INHIBITION OF INDUCTION OF MUTATIONS BY THIOPHOSPHAMIDE IN REPRODUCTIVE AND SOMATIC CELLS OF MICE

Moscow GENETIKA in Russian Vol 20, No 2, Feb 84  
(manuscript received 1 Apr 83, in final form 6 Jun 83) pp 365-366

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[Abstract] Since arsenic compounds are used in numerous agricultural applications and in metallurgy, environmental protection and by-product utilization are significant problems. Concern for their comutational and cocarcinogenic properties led the authors to study  $AsO_3$ 's reaction to the alkylizing agent thiophosphamide in somatic and reproductive cells of 2-month-old mice of the CBAXC57B1/6j line. Results indicated that at a dosage of 0.5 mg/kg body weight, a statistically significant induction of

dominant lethal mutation was observed at the late spermatid and micronuclear stages in erythrocytes of bone marrow.  $\text{AsO}_3$  doses of 0.5, 1 and 5 mg/kg body weight did not affect reproductive cells, but did cause progressively greater numbers of micronuclei in bone marrow erythrocytes. Inhibition of mutagenic activity of thiophosphamide may be a result of the effect of  $\text{AsO}_3$  on repair processes that are like those reported in microorganisms. Figures 1; references 7: 2 Russian, 5 Western.  
[1507-12131]

## PHYSIOLOGY

### MODEL CNS REGULATION OF MOVEMENT TRAJECTORIES

Moscow BIOFIZIKA in Russian Vol 29, No 2, Mar-Apr 84  
(manuscript received 5 Jan 83) pp 306-309

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[Abstract] A CNS model has been devised to account for graded changes in muscle torque and joint angle, which essentially relies on two fundamental commands--reciprocity and coactivation--for the control of a pair of antagonistic muscles. Each command is subject to graded modulation by information transmitted along a serial ensemble of neurons, with propagation controlled by a CNS center. As the wavefront of activation progresses, the number of tonically active output neurons increases and makes discrete contribution to the corresponding command on the basis of superimposition. The change in the velocity of the reciprocal command wavefront determines the rate of joint movement, i.e., change in angle, while the final position determines the target angle, i.e., the final position of a limb. The coactivation command enhances the stability of the mechanical system during movement, and thereafter recedes to background values. Such an approach may be used for a more detailed analysis of the trajectories of head and eye movements. Figures 2; references 9: 3 Russian, 6 Western.  
[1511-12172]

## NEUROHUMORAL REGULATION OF IMMUNE HOMEOSTASIS DURING ADAPTATION PROCESS TO EXTREMAL LOADS ON A MODEL OF CONTEMPORARY SPORT

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 2, Mar 84

(manuscript received 2 Nov 83) pp 506-509

KASSIL', G. N., LEVANDO, V. A., SUZDAL'NITSKIY, R. S., PERSHIN, B. B. and KUZ'MIN, S. N., All Union Scientific Research Institute of Physical Culture, Moscow

[Abstract] Neurohumoral regulation of immune homeostasis was studied during adaptations of human subjects to extreme physical loads using current sport activities as a model. Indices of local, secretory and cellular immunity were studied along with metabolic mechanisms and various characteristics of hypothalamo-hypophyseal-adrenal system. The titers of normal antibodies and some immunoglobulins dropped practically to zero after maximally tolerated muscular and psychoemotional loads characterizing modern sport. Prolonged training, annual competitions connected with the lowering of sympatho-adrenal system lead to depression of protective powers of an organism, to the so called "phenomenon of disappearing antibodies". During this period, corticosteroids facilitate depression of immunity. Increased activity of the sympathoadrenal system, due to performance-stimulating preparations, support immune homeostasis. Figures 2; references 15: 13 Russian, 2 Western. [648-7813]

## SYNAPTIC REGULATION OF CALCIUM CURRENT IN BUNDLE NEURON PPa1 IN EDIBLE SNAIL

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84

(manuscript received 20 Jun 83) pp 231-234

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[Abstract] Electrophysiological studies were carried out on bundle neuron PPa1 in the edible snail to correlate spontaneous inhibitory postsynaptic currents (IPSC) with calcium fluxes. Onset of IPSC was found to correlate with a decrease in the calcium flux of approximately 50%; with abatement of IPSC, calcium influx returned to normal levels. In conjunction with other published data, the observations were interpreted to reflect a situation in which the neurotransmitter inducing IPSC leads to activation of adenylate cyclase in PPa1, and the elevated levels of cAMP are responsible for inhibition of the calcium flux. It has previously been established that ionophoretic injection of cAMP into the edible snail neurons diminishes calcium influx [Kononenko, NI, et al., NEYROFIZIOLOGIYA, 14(3):290, 1982]. Figures 2; references 10: 4 Russian, 6 Western. [649-12172]

## METABOLISM OF 25-HYDROXYCHOLECALCIFEROL AND ITS REGULATION IN HYPOKINETIC RATS

Moscow BIOKHIMIYA in Russian Vol 49, No 4, Apr 84  
(manuscript received 5 Jul 83) pp 590-598

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of Medical Sciences, Moscow

[Abstract] Studies were conducted on the effects of short-term (7 days) and long-term (28 days) hypokinesia of Wistar rats on the metabolism of vitamin D<sub>3</sub>, by administration of radiolabeled 25-hydroxycholecalciferol 18 h before sacrifice. The animals were maintained on standard laboratory diet during the experimental period with optimum calcium (0.6%) and phosphorus (0.6%) content. Analysis of various tissues for the metabolites of 25-hydroxycholecalciferol revealed that hypokinesia led to depression of 1,25-dihydroxycholecalciferol and elevation of 24,25-dihydroxycholecalciferol in the serum and kidneys. The levels of both metabolites in the bones and the mucosa of the small intestine were decreased. The data indicated that hypokinesia led to a decrease in the synthesis of 1,25-dihydroxycholecalciferol by the kidneys, while increasing renal biosynthesis of 24,25-dihydroxycholecalciferol. Concomitantly, binding of the latter in the small intestine and the bones was diminished by hypokinesia. These changes were interpreted to reflect long-term adaptation to hypokinesia intended to maintain calcium homeostasis and patency of the bony tissues. Figures 2; references 30: 8 Russian, 22 Western.  
[1500-12172]

## PUBLIC HEALTH

### PHYSICIAN'S MEETING IN ARMENIAN SSR

GF121800 Yerevan SOVETAKAN AYASTAN in Armenian 22 May 84 p 2

[Excerpts] During the republic-wide rural physicians' meeting, the condition of medical aid to the population and of providing the population with medicines and the tasks of the Armenian health organs toward further improvement in these areas were discussed. G. Arutyunyan, deputy Armenian SSR health minister, delivered a speech.

The meeting noted that at the current stage the primary task of the republic's health organs and establishments is to improve and strengthen the material and technical basis of rural health care. The solution of that most important task is constantly at the center of attention of the party and Soviet organs. During recent years, 2,700-bed hospitals and polyclinics for 4,000 consultations per shift have been opened in the rural rayons.

Substantial work is being carried out to use the cooperative resources of the industrial enterprises, kolkhozes and sovkhozes and the ministries and administrations for the construction of medical establishments. On the basis of those means, at the moment 39 installations are being constructed including 1,280-bed hospitals and polyclinics for 2,530 consultations per shift. Apart from that, plans for 30 medical establishments are being formulated.

The meeting participants adopted a petition addressed to the rural health workers in which they called on them to use all efforts, knowledge and expertise to provide the rural population with efficient medical assistance.

E. Gabriyelyan, Armenian SSR health minister, addressed the meeting.

CSO: 1840/666

## INSECTS USED IN PLANT PROTECTION

Frunze SOVETSKAYA KIRGIZIYA in Russian 12 Jun 84 p 3

[Article by Ye. Alikhanyan, TASS correspondent: "Insects Protect the Harvest"]

[Text] Tiny insects discovered by scientists at the Zoology Institute of the UkSSR Academy of Sciences will be able to replace hundreds of tons of the most effective chemical poisons. The Ukrainian entomologists have not only found a whole group of living creatures previously unknown to science, they have also determined their role in the general complex of the biosphere.

Without polluting the environment, these tiny four-winged flies with sharp proboscises can destroy whole populations of garden and forest pests and they can kill particularly persistent weeds in fields sown with valuable crops.

M. Zerova, doctor of biological sciences and laboratory chief at the institute, said, "The chemical means now being used to protect the harvest are fraught not only with the danger of polluting the biosphere, but also with several other negative side effects. That is why biological methods for combatting pests are now being given top priority.

"Recently scientists at our institute have discovered over 120 types of useful insects that are nature's 'orderlies'. Among these are organisms that attack bugs that live as parasites on grain crops; organisms that attack the leaf roller, a harmful pest in fruit trees; and organisms that attack various moths that eat tree leaves. The zoologists have also discovered over 40 types of organisms that are new to the fauna of the republic and are very effective enemies of ticks that are poisonous to plants. Several of these types have been reproduced at special biological factories and are already "working" at farms. Recently a study has been done on insects that attack weeds such as couch grass, several types of darnel, steppe weed grass, and poison mustard."

The research done by the Ukrainian entomologists is opening up broad opportunities for developing effective, new methods of plant protection and it is making an important contribution to fulfilling the Food Program.

9967

CSO: 1840/656

LITHUANIAN MINISTER OF HEALTH RESPONDS TO COMPLAINTS ABOUT MEDICAL  
CENTRALIZATION

Vilnius SOVETSKAYA LITVA in Russian 9 Jun 84 p 2

[Article by Lithuanian Minister of Health I. Platukis: "Shortcomings Will  
Be Eliminated"]

[Text] The Vilnius Fuel Equipment Plant, has, for many years, had the services of a medical care station [medpunkt] in which specialists of several profiles used to work. Workers of the enterprise could go there to get prompt and qualified help without having to lose precious work time in order to get to a physician or follow a prescribed course of treatment and a number of procedures.

When construction began on a new polyclinic at the Vilnius City Clinical Hospital, part of the personnel of the plant medical station were transferred there. Unfortunately, many difficulties have now come up for the people in the plant. In the new polyclinic, one sometimes has to spend a long time to get to the physician, to have some tests done... Wouldn't it be worthwhile to go back to the former method of serving personnel collectives of large enterprises--through plant medical stations?

Workers A. Semenyuk and I. Yarmolkovich of Vilnius Fuel Equipment Plant imeni 50-Letiye SSSR have written to the editorial office about this.

The editors passed along the remarks expressed in the letters to the republic Ministry of Health. At our request, today I. Platukis, Lithuanian Minister of Health, replies to the questions posed by the authors.

The situation which has arisen has been a subject of discussion in the republic Ministry of Health. We analyzed the problems of medical service for workers of industrial enterprises in the polyclinic of Vilnius City Clinical Hospital and planned specific measures to improve the work.

But, evidently, it is necessary to explain the heart of the matter. When the new polyclinic went into construction, 34,500 workers of industrial enterprises were registered for medical service here, including large plants such as the Fuel Equipment Plant, the Calculator Plant, and others.

Before the opening of this treatment establishment, workers of the above enterprises received service in plant medical stations. Working in them were both physicians of a broad profile and specialists. But this was a forced and temporary measure--there were not enough offices in the building of Soviet Clinical Polyclinic No 1. On completion of construction of the polyclinic in Antakalnis, the city Department of Health, in accordance with USSR Ministry of Health Order No 999 of 10 November 1982, took the decision to centralize specialized medical aid. This centralization and the organization of double-shift work of specialists was supposed to provide all workers of industrial enterprises with the opportunity to get to a physician in their spare time.

But, because of the lack of the necessary number of specialists and also organizational irregularities in the initial period of operation of the polyclinic, there were cases, described in the workers' letter, when it was difficult for all patients served by this polyclinic to get in quickly to see the physician. This caused people to make well-justified complaints. The administrations of the above enterprises expressed their observations and requests that the specialists be returned to the medical stations.

In connection with this, I would like once more to bring to your attention the fact that, currently, the staffs of plant medical stations are assembled in accordance with norms stipulated by order of the USSR Ministry of Health, as I have mentioned, and we do not have the power to go beyond them.

Now about the measures being taken to improve the work at the polyclinic of Vilnius City Clinical Hospital. In May, the republic Ministry of Health sent to work in this polyclinic specialists (neuropathologists, oculists) from other treatment establishments. Separate receiving hours have been organized for workers from industrial enterprises to see specialists, as well as telephoning the previous record to specialists in the plant medical station. All this, in our view, should guarantee workers complete medical service in their free time. The polyclinic administration is responsible for constantly checking the work in rendering medical aid to workers of industrial enterprises.

While I have the chance, I will also reply through the newspaper to a number of letters relating to the work of the traumatological service in Vilnius. An overhaul of the traumatological departments of Soviet Clinical Hospital No 1 is scheduled to begin in the 3rd quarter of 1984. The necessary aid in this area will be organized in another treatment-prophylactic establishment and partly in Soviet Clinical Hospital No 1. We hope that the problems connected with traumatology can be fully resolved when the first aid hospital is built. Work in designing it is already underway. Construction is scheduled to begin in 1986, and should be completed in 1990.

12255  
CSO: 1840/655

## BRIEF

**JOB OPENINGS FOR SCIENTISTS**--Scientific Research Institute of Oncology and Medical Radiology, Belorussian Ministry of Health, announces a competition to fill vacancies in the following positions: junior scientific associate (2) for diagnostic x-ray department; senior scientific associate (candidate of medical sciences) and junior scientific associate (2) for department of morphological methods of investigation; senior scientific associate (candidate of medical sciences) for laboratory of physicochemical and immunological methods of tumor detection; junior scientific associate (3) for department of surgical and combined treatment methods; junior scientific associate (2) for department of chemotherapy and radiation therapy with experimental laboratory; senior scientific associate (candidate of medical sciences) for high-energy department; junior scientific associate (2) for department of combined methods of treating tumors of the head and neck; junior scientific associate for department of organizational and methodological work. Documents must be submitted within 1 month of publication of this announcement. Documents to be sent to the following address: 223052, Minsk, Lesnoye Office, Scientific Research Institute of Oncology and Medical Radiology, Russian Ministry of Health. [Text] [Minsk SOVETSKAYA BELORUSSIYA] [Russian 18 Apr 84 p 4] 10,657

## BRIEFS

**MEDICAL WORKERS HOLIDAY**--Preserving the health of the Soviet individual is one of the important social tasks of our society. There has been great development in health care in Kazakhstan. There are 4200 medical establishments in operation here, employing hundreds of thousands of physicians, nurses, and pharmacists. Their efforts are directed at achieving the tasks for improved treatment-preventive aid which were set at the June 1983 and subsequent plenums of the CPSU Central Committee. This was discussed at a ceremonial meeting dedicated to the Day of the Medical Worker, held on July 15 in Alma-Ata, in the State Academic Russian Theater of Drama imeni M. Yu. Lermontov. It was opened by Sh. B. Imanov, secretary of the Alma-Ata Gorkom of the Kazakh Communist Party. With great enthusiasm, the meeting chose an honorary presidium consisting of the Politburo of the Leninist CPSU Central Committee headed by Comrade K. U. Chernenko. Successes achieved by medical personnel were discussed on their professional holiday by M. A. Aliyev, Kazakh minister of health, and other speakers. Present at the meeting were K. K. Kazybayev, secretary of the Kazakh Communist Party Central Committee; O. I. Zheltikov, deputy chairman of the Kazakh Council of Ministers; S. T. Temirbekov, head of the Kazakh Communist Party Central Committee Department of Science and Educational Institutions; leaders of a number of republic ministries and departments; and representatives of the community. [KazTAG article] [Text] [Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 16 Jun 84 p 3 (23)]12255

**PRIZE FOR VYRU HOSPITAL DESIGN**--A group of specialists and workers of the Estonproyekt Institute and the republic Ministry of Construction Agricultural Trust was awarded the prize in the competition held by the USSR Council of Ministers for the design and construction of Vyru Central Hospital. The hospital consists of a 9-story main building, 2-story infection building, and single-story business building. They are connected by underground passages. The hospital was designed for 400 places. It is distinguished for its compact volume-design resolution. The internal structure uses long-lasting, inexpensive materials. The beauty of the interior was achieved by architectural-dimensional methods, skilled use of color, and high-quality work. Advanced methods were used in organizing and carrying out construction and assembly tasks. Competitions of skill were held for plasterers, platers [plitochniki], painters, and placers of

relinovyye [unidentified] and linoleum coverings. The frame was assembled by the straight-line flow method. The rayon hospital in Vyru has become a treatment center of south Estonia. [Text] [Moscow EKONOMICHEskAYA GAZETA in Russian No 25, Jun 84 p 9 (23)] 12255

CSO: 1840/653

## GROW WELL, INFANT!

Moscow VECHERNAYA MOSKVA in Russian 10 May 84 p 2

SAMOYLOV, B.

[Abstract] The operation of the obstetrics department in the No 10 Pediatric Hospital located at Vyatskiy Crossroads 4, Moscow, is briefly described. The chief physician, Aleksandr Aleksandrovich Sidorov, gave the author a conducted tour of the facility. B. L. Rubinshteyn, the facility's first chief physician, and L. V. Poz, a former deputy chief physician, are still retained as consultants. The facility cooperates closely with the All-Union Center for Mothers and Babies to develop new diagnostic and therapeutic methods. The facility has an ultrasound diagnostic section used for in utero examination of the fetus at 7-8 weeks. Anesthesia, including electroanalgesia, is used extensively in the delivery room, which is also equipped with artificial respiration equipment for new-born infants. A resuscitation and intensive care unit is located close to the delivery room for the care of premature babies. No references.

[659-9642]

## INFANTS SHOULD BE BORN HEALTHY

Moscow SOVETSKAYA ZHENSHCHINA in Russian No 3, Mar 84 p 9

Interview by BARASHKOVA, N.

[Abstract] This is a report of an interview with A. G. Gracheva--deputy minister of health, RSFSR Ministry of Health, professor, doctor of medical sciences, administrator of pediatrics and delivery assistance service. The territory of the Russian Federation is very large and this creates some problems in providing proper care for pregnant women during the delivery. To provide proper assistance of various specialists, a system of "risk assessment" should be developed for each woman so that problem cases could be given proper attention. At present, women are less prepared to give birth than they were some 20 years ago; this is due to lack of physical exercise, hypodynamics, smoking, drinking, etc. Some problems originated during their teens and even earlier in life, and were never properly treated.

To avoid later problems, girls from the age of 13-14 years should be examined routinely by a pediatrician and a gynecologist. Actually a good history begins shortly after the birth of each individual; local pediatricians should monitor development of their "patients" during their formative years.

[627-7813]

BE HEALTHY

Ashkabad TURKMENSKAYA ISKRA in Russian 22 May 84 p 4

PRIKHOD'KO, Ye., Interviewer

[Abstract] Recently a Pulmonological Division was opened at the Republic Clinical Hospital (RCH) imeni N. I. Pirogov, which has improved the diagnostic and therapeutic efficacy of this institution. The Chief Physician of RCH, Chary Nazarovich, was interviewed by Ye. Prikhod'ko in respect to the newest technological advances implemented at this hospital. Physician Nazarovich, candidate of medical sciences, stated that an angiocardigraphic unit manufactured by the West German Company Siemens, was being activated, which will improve, considerably, diagnostic and therapeutic ability at the clinic. In addition, the laser scalpel "Romashka" is being used very effectively in bloodless neurosurgical interventions. Organizationally, the trend is to limit the bed occupancy to treatment, while performing diagnostic procedures on an ambulatory basis; a prenatal diagnostic unit is being organized and centralized service should provide more effective technical service to admitted patients.

[636-7813]

## PSYCHOLOGY

### SOCIOPSYCHOLOGICAL IMPACT OF SPORTS ON PUBLIC AWARENESS

Moscow TEORIYA I PRAKTIKA FIZICHESKOY KUL'TURY in Russian No 4, Apr 84  
pp 37-39

[Article by I. P. Volkov, doctor of psychological sciences, and Prof N. I. Ponomarev, doctor of pedagogic sciences, State "Order of Lenin and Order of Red Banner" Institute of Physical Culture imeni P. F. Lesgaft]

[Text] In modern society, sports are viewed as an effective means of influencing mass awareness and behavior of people. It is a new function of sports, which was formed during the period of the scientific and technological revolution in connection with the tremendous development of SMK--mass media (news-papers, journals, periodicals, books, advertisement, movies, television). The influence of sports on human consciousness in modern developed countries, where up to 98% of the population have television, has acquired a genuinely all-encompassing nature. The television audiences of sports fans constitute astronomic numbers, billions of people, for telecasts of world series of soccer or hockey games. Sports events have become some of the most accessible modern shows, the draw of which is the reason for their sociopsychological effects on public awareness on a mass scale [8].

Mass awareness of modern people is an auditory form of reflection of reality, impressions of which are gleaned from the mass media channels. It is formed under the effect of information processes that circulate over mass media channels (primarily radio, advertising, movies, television), and it is an active form of everyday awareness, in the structure of which elements of perception of typical examples of social, standard behavior are organically merged with emotional experiences and mass affects, with real actions, deeds and interpersonal relations within a given perceived social context [3, 9].

The powerful sociopsychological impact of mass media, with use of information about sports, led to the fact that there was formation of specific categories of "consumers" of such information, who are called "television sports fans." At the same time, mass media were instrumental in popularizing all presently known types of sports, which raised the social prestige of sports events, caused them to grow to a massive scale and achieve the highest sports results.

Being one of the most popular visual forms of art, a sports show also has an enormous communicative potential of sociopsychological impact, both on the state of mass awareness of people and on processes of their mass

communication. The need to investigate the mechanisms, factors, patterns and results of this influence is an important element in scientific support of measures for further increase in scope of physical culture and sports in our country.

In the opinion of specialists, the spectator function of sports as an art is presently underestimated, and for this reason it is not studied. Yet, as noted by the formerly well-known soccer coach and actor, Mikhail Sushkov, "sports and art are closer than we think. It is not in vain that both singers and orators, as well as musicians participated in ancient Olympics. Of course, the basic difference between art and sports is that the latter are primarily competitive and then only a spectacle, whereas in art, on the contrary, the spectacle is primary and competitiveness secondary" [7, p 86]. Such ideas can also be found in the works of art sociologists.

Thus, one of the prominent specialists in psychology and sociology of art, N. A. Khrenov, observes that, at the turn of the century, when mass media underwent intensive development and large sports areas were built in cities, "sports spectacles became a distinctive reference point for the entire world of spectacles. They began to initiate experiments in artistic spectacles, influence the circus, stage, theater and movies" [8, p 43]. Many well-known old masters, like modern writers and directors, were inspired by sports. It is known that I. Duncan, the ballerina and director, publicly professed her love for gymnastics as the embodiment of human sophistication of movement. The well-known theater and motion picture directors, A. Tairov, Vs. Meyerkhol'd, S. Eizenshteyn and others took much from sports.

In the history of not only modern, but ancient society, sports were advanced to one of the first places in the system of public spectacles performing the function of shaping public mood and mass communication of people as spectators. This is understandable, since the spectator quality of sports contains, along with psychological and esthetic potential impact, a distinctive ideological charge, propagandizing socially necessary ideals approved by society, of physical education and personality development. The ancient Greeks, for example, considered the Olympic stadium and its immediate vicinity as an ideal visible space during Olympic games for direct human contact, direct area of social communication between people united by common feelings and interests, need to be involved in the sports competition and struggle in the sports area. The symbols of athletic glory embodied this space of direct communication of representatives not only of the polis [government] but for the entire visible world for the ancient Greek, the ecumens. This effect of sports on human awareness in antiquity was achieved by a system of rituals for the opening, performance and conclusion of competitions, bestowing awards to the victors and incentives for participants. There were incentives for all elements of theatrical behavior of athletes instrumental in religious and esthetic perception of the sport as the highest social asset. The athlete's resemblance to sculptures of ancient Greek gods and heroes has been immortalized in ancient statues. Thus, already at the dawn of history, sports performed the function of a visual effect on mass awareness and feelings of people, the powerful development of which was aided by modern mass media. Sports and spectacle are synonyms, and it is thus not by chance that development of ancient sports is related to development of ancient Greek theater and art as a whole [5].

In the Middle Ages, the ideal sportsman was embodied by a knight, contained in armor, together with his steed. The duels between knights extolled in the novels of Walter Scott were, perhaps, the only sports spectacle that was officially encouraged by the feudal aristocracy and the church. The military and feudal aristocracy was interested in a utilitarian purpose, the physical education of a knight equally capable of both a sporting duel (often for his "lady love") and of plundering wars, as well as suppression of peasant unrest and artisans' riots.

As noted by the social psychologist, B. D. Parygin, the psychological role of a spectacle is particularly great for an individual in his leisure time. It is expressly then that the "space for personality development" mentioned by K. Marx appears [8, p 3]. In the opinion of sociologists, in this era of scientific and technological revolution, viewing a sports spectacle with its peripeteia of an exciting sports struggle is a substituting form of biosocial activity of the personality. It returns to a person psychological freshness after tiring work, restores a balance between spiritual and physical forces. However, the tremendous development of modern mass media (movies and television, particularly in color), with the unlimited draw of a sports spectacle and manipulation of perceived images, have led to hypertrophy of the above-mentioned replacing and psychotherapeutic function of a sports spectacle, which caused inversion of the spectators' mental activity: instead of wanting to participate actively themselves in physical culture and sports after watching a sports telecast, they wait for it to be shown again. This intensifies hypodynamia and the probability of its adverse consequences to health. Studies of the adverse sociopsychological effects of sports spectacles on the public have not yet been made, although there have been recorded cases of panic, human victims, etc.

In western culture, the intensive development of modern mass media was instrumental in transforming sports shows into one of the most advantageous forms of commercial advertising. Capitalism not only generated mass spectator sports, within the limits of which modern Olympic games were resumed, but professional and commercial sports, the popularity of which with spectators is common knowledge. A superman ("superathlete") demonstrating to the public his athletic skill for pay is the ideal of professional and commercial sport. Many outstanding athletes who have finished their performance in an Olympic sport change to professional and commercial sport, which encourages the bourgeois interest in a man who has won (or earned) some capital, but not through a lucky happenstance, but as a result of a persistent athletic struggle with equal rivals. The falseness of bourgeois morals, corruption among athletes and coaches, financial machinations of organizers of sports shows and matches can often be discerned under this guise, which is attractive to the public. The state of public mass awareness is taken into consideration only to gain maximum profit from exhibiting sports spectacles [2].

K. Marx mentioned, in "Das Kapital," that from the standpoint of capitalistic society, all good deeds are ultimately good deeds only to the extent that they can emerge as a means of multiplying capital. "Monetary economics logically lead to equating a good deed with monetary success" [4, p 154].

Socialism propagandizes basically different sports ideals, having taken over its Olympic traditions and standards. In a socialist society, athletic

training is based on principles of Marxist-Leninist ideology and Soviet pedagogics. Professionalism in sports of highest achievements has the same ethical bases of sports education as the entire system of communist education of young people. The qualities of citizen of one's socialist homeland emerge as the dominant traits in the athlete's personality. A material incentive for athletic growth on the highest levels of sports skill is not self-sufficient as in professional and commercial bourgeois sports, but subsidiary, subordinate to moral incentive. The commercial function of sports spectacles is controlled by the state, rather than private entrepreneur initiative as in capitalistic countries [2, 5, 7].

Thus, in discussing the sociopsychological impact of sports spectacles on mass awareness, it is necessary to make a clear distinction of the contrast between ideologies of sports training in bourgeois and socialist worlds which, however, does not deprive sports themselves of general human content, elements of which are also reflected in mass awareness when viewing sports spectacles and receiving information about sports performances. These elements also include the sociopsychological mechanism of perception of the publicity of a sports competition, which generates in fans the illusion of being involved in the actions of athletes, active feelings of experiencing the games. Sports and games, sports and spectacles are links in the same associative thought and emotional chain of mental processes that arise in the consciousness of sports fans and participants in competitions.

In this regard, it is mentioned in the literature dealing with the subject that a sports spectacle, by virtue of its popularity under urban living conditions, "performs primarily the function of direct group interaction, compensating for the ritual-spectacle culture of former eras" [8, p 43]. Sports fans are a variant of a crowd with its inherent mass-scale sociopsychological processes in the form of spontaneous transmission of information (rumors, talk), dynamics of mass moods, fashion, possibility of panic, etc; for example, fights between opposing groups of fans, human victims as a result of panic in the stadium, etc. [6].

Such essential features as social phenomena are also referable to universally human, sociopsychological elements of sports fixed in mass consciousness of people: sport as a game, sport as a means of improving health, training, school for courage and training for work, sport as a means of self-assertion, a political means of fighting for peace and propaganda of highest sports achievements; sport as an active life style and activity, sport as a means of gaining and defending the social prestige of national teams at international contests, etc. The Olympic charter reflects these standards common to all mankind of using sports in social life; it demands that all nations and athletes adhere to the same general human moral-ethical statutes for sports competition, which are in essence an ideal model of human interaction.

In addition to the foregoing, we can refer to highest achievement sports, the organization and technology of which have much in common for all countries of the world that are developed with respect to sports: moral and physical incentives for athletic refinement, grading of physical loads, planning sports training and monitoring the athlete's training, time studies, advertising sports achievements, etc. At international contests, the national scratch

teams represent countries with different political systems; they are all united by the common desire to be victorious over their rivals, to demonstrate the best results in the sports struggle. Each country is inherently interested in the victories of its athletes at Olympic games, since these victories contain a powerful source and reserve for further growth of sports achievements. The victors of international competitions are associated in mass consciousness with images of heroes, strong people and active personalities. Thanks to the perception of these images, there is development of processes of identification, social imitation, emotional participation in the sports victories of popular athletes. Analogous processes are observed upon perception of images of popular actors in the theater, on the stage and in the movies. Sports are no exception in this regard.

Thus, there are many factors and conditions involved in the sociopsychological effect of sports on mass consciousness, among which sports spectacles and victors of sports competitions are given a central place. The psychological effects of prestige, when viewing the victory of some team or athlete at competitions, are combined in the consciousness of spectators and fans with esthetic and moral-emotional satisfaction, which becomes upon subsequent mental processing the content of man's consciousness as the consumer of sports information that circulates over mass media channels. These are some of the mechanisms of sociopsychological impact of sports on mass awareness of people.

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## TOWARDS COMPUTER PSYCHODIAGNOSIS

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, SERIYA 14: PSIKHOLOGIYA  
in Russian No 2, Apr-Jun 84 (manuscript received 20 Dec 83) pp 13-16

SHMELEV, A. G.

[Abstract] In this paper, the author discusses some aspects of the preceding paper by S. S. Lavrov ["Procedural and Psychological Problems of Dialogue Systems"], agreeing with Lavrov's principal points. Further progress in computerization and communication will be slowed down without effective solution of the problems of "psychology of the programmer" and "psychology of the user". Thanks to the "psychologization" of computer technology, algorithmic high level languages have appeared making it possible to utilize large functional blocks. The differential-psychological side of the problem is not addressed adequately. "Assembler" was used repeatedly as the aim for many tasks at hand, and it is pointed out as an example of current trends in computerization. Mini- and microcomputers are identified as instruments allowing a programmer-user maximum creative freedom. Again, Lavrov is quoted as a proponent of the correct concepts: fine tuning of a machine must be done at the user's end. To achieve a more refined elaboration of differential-psychological problems, computer psychodiagnosis of a cognitive style must be developed. Current computers should aid various specialists in avoiding limitations and inadequacies as well as tunnel vision. The road to this specialization goes through three stages: 1) computer psychodiagnosis of individual type; 2) individualized education; and 3) mastery of thorough analytical thinking processes permitting rapid switch over from one symbol system to another and systematic grasp of phenomena, algorithmicity and heuristics.  
[1504-7813]

## PSYCHOLOGICAL STRUCTURE OF "MAN-COMPUTER" DIALOGUE

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, SERIYA 14: PSIKHOLOGIYA  
in Russian No 2, Apr-Jun 84 (manuscript received 26 Dec 83) pp 17-24

TIKHOMIROV, O. K.

[Abstract] In 1983 a conference was held in Protvino on the subject "Man-Computer Dialogue". In this paper the author reports experience gained in the study of dialogue systems from the position of psychology. The paper presented at the 1983 conference was used as the basis of this report. The dialogue between man and computers covers many aspects: general requirements security, activity, image of the partner, comprehension, time, utilization and effectiveness. Effects of a dialogue with a computer are manifested not only in individual behavior but also in group activity. Each of above parameters may be used in optimizing and controlling the dialogue. Optimization of the dialogue may be achieved by personification of machine programs, selection of "individualistic" characteristics of the programs processing optimal motivational effect on the user. Development of psychological principles for increased effectiveness of automated dialogue systems is a relatively new branch of applied psychology. Psychologists should begin to address new types of intellectual activities: "problem solutions", "goal formations", "prognostications", "conceptualization", etc. The new psychologists should be able to use computers and work on evaluation and improvements of the automated dialogue systems using psychological criteria. References 11 (Russian).  
[1504-7813]

UDC 575.24:599.323

MUTAGENIC ACTION OF TRITIUM ON REPRODUCTIVE CELLS OF MALE MICE. REPORT 1.  
INDUCTION OF DOMINANT LETHAL MUTATION BY TRITIUM OXIDE AND EVALUATION OF  
RBE

Moscow GENETIKA in Russian Vol 20, No 2, Feb 84  
(manuscript received 27 Sep 82) pp 224-231

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[Abstract] The most common radionuclide found in humans, tritium oxide released during atmospheric nuclear tests, has drawn the interest of researchers seeking to determine long effects of this environmental contaminant. At the same time it is used for its biological effects in medicine. The present article reports on study of the occurrence of dominant lethal mutations (DLM) in gametes of male mice after exposure to 0.5-4 gram-roentgens by either introduction of tritium oxide (THO) or external radiation with Cs137. The tests studied 500 male and 2500 female albino mice in test and control groups. The females were dissected 17-18 days after sexual contact to determine the number of corpora luteum in utera, the place of implantation and the number of dead embryos. Mean activity of blood serum and of testicles were also measured by dissecting males. Of 444 females examined, 300 were pregnant. Where males had received 0.5-1 gram-roentgen of radiation, a normal distribution of pregnancy anomalies occurred, but with larger doses a direct correlation between radiation dose and dead embryos or misimplantations was found. Radiation lethality increased exponentially with the time after exposure, and little recovery of normalcy was observed. The greatest RBE was noted for the lowest doses of THO which, like Cs137, was found to be lethal at <0.1 gram roentgen. Figures 4; references 18: 10 Russian, 8 Western. [1507-12131]

CLONING OF cDNA OF INDIVIDUAL GENOMIC RNA MOLECULES OF BARLEY STRIPE  
MOSAIC VIRUS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 275, No 1, Mar 84  
(manuscript received 4 Oct 83) pp 186-188

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[Abstract] Standard techniques of genetic engineering were employed to obtain single-stranded cDNA molecules corresponding to the four genomic RNA molecules of barley stripe mosaic virus. Subsequent structural analysis of the individual cDNA molecules confirmed the individuality of the corresponding RNA molecules. Utilizing DNA polymerase I double-stranded cDNA molecules were prepared from the single-stranded molecules and, again with standard techniques, incorporated into plasmid pBR322. The recombinant pBR322 DNA was then used for the transformation of *E. coli*. Analysis of a number of clones demonstrated that the incorporated segments included complementary sequences of the 3'-terminus of each of the four viral RNAs. The DNA copies can, in view of this, provide structural information on the tRNA-like region adjacent to the poly(A) bloc and on the coding characteristics of the 3'-end region of the viral RNAs. Figures 2; references 14 (Western).

[649-12172]

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### BRIEF

PSYCHIATRIC SYMPOSIUM OPENS IN BAKU--The task of further improving medical service to the Soviet people demands increased effectiveness of work of all services in the health-care system. Many serious problems in this regard face psychiatrists. The accelerated tempo of life leads to an increased number of stress situations and nervous overloads, and this makes it necessary for specialists to become active in revealing people who are in need of medical aid, to give them timely treatment, and to improve prevention of disorders. Theoretical and clinical problems of modern psychiatry and drug treatment [narkologiya] are being discussed at the All-Union Symposium which opened on 17 May in Baku. Participating in the symposium are guests from abroad--representatives of Bulgaria, the GDR, Poland, Czechoslovakia, Finland, the FRG, Switzerland, and Yugoslavia. The symposium was opened with an introductory speech from USSR Academy of Medical Sciences Academician G. V. Morozov, chairman of the All-Union Scientific Society of Neuropathologists and Psychiatrists. Participants and guests of the symposium were greeted by Azerbaijan Minister of Health T. A. Kasumov. [Azerinform article] [Text] [Baku BAKINSKIY RABOCHIY in Russian 28 May 84 p 3 (29)] 12255

## MISCELLANEOUS

### PHYSICAL CULTURE AS ONE OF MOST IMPORTANT MEANS OF COMMUNISTIC EDUCATION OF VIETNAMESE PEOPLE

Moscow TEORIYA I PRAKTIKA FIZICHESKOY KUL'TURY in Russian No 4, Apr 84  
pp 58-60

[Article by Vu Dao Khung and Nguen Zan' Tkhay (Socialist Republic of Vietnam),  
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imeni P. F. Lesgaft]

[Text] The communist party of Vietnam makes extensive use of various means  
of educating the Vietnamese people in the spirit of ideas of building socialism.  
This is particularly important in view of the fact that the cultural and ideo-  
logical revolution, which is taking place now in SRV [Socialist Republic of  
Vietnam], covers all aspects of the life of the Vietnamese people. Physical  
culture holds an important place among such means.

The educational relevance of physical culture and its capabilities with  
regard to solving problems of the cultural and ideological revolution in SRV  
have not been adequately disclosed in works by Vietnamese specialists in  
theory of physical education and history of physical culture.

In characterizing physical culture, analysis was not made of its relations to  
culture of the people and society as a whole; there has not been sufficient  
exploration of its specifics and role in developing the culture of society.  
Yet further development of physical culture in the country is instrumental  
in development of the entire socialist culture of the Vietnamese people and  
improving the effectiveness of educational work.

Physical culture is increasingly attracting the attention of representatives  
of social sciences--philosophers, sociologists and historians. They are  
interested in the social nature of physical culture, the patterns of its  
inception and development, place and function in society.

In works by Soviet scientists, emphasis is laid on problems of development of  
culture of mature socialism. It is stressed that a new culture was produced  
and is successfully developing in a socialist society, which has become  
firmly established as a result of the revolutionary activities of the working  
class, its struggle for the victory of the socialist world view and ideals of  
communism.

The basic features of socialist culture are national unity and communistic party spirit, socialistic collectivism and revolutionary humanism, proletarian internationalism and historical optimism, its purposeful dynamism (M. P. Kim, 1972; G. G. Karpov, 1973; G. L. Smirnov, 1973, and others).

The purpose of socialist culture is to shape a new man who, in the expression of K. Marx, having crossed to the other side of his own physical production will no longer be entirely subordinate to it, but will impart to his work the flavor of free creativity aimed at comprehensive development and improvement of the personality itself.

The main objective of all socialistic transformations in the area of culture is to form a new man embodying the traits and features of a communistic personality. The process of formation of such a personality requires a long historical time, which covers the entire period from capitalism to the highest phase of communism. But it is only under socialism that one can provide the necessary physical and spiritual conditions for practical implementation of this process (V. M. Mezhujev, 1977).

In the period of 1960-1983, new conceptions were formulated in the works of Soviet specialists in history and theory of physical culture, which are based on use of the systems approach and methodology of modern theory of culture. They amount in essence to the fact that, having emerged in the womb of general culture, in the course of its historical development physical culture is changing into an independent area of socially necessary activity (V. M. Vydrin, 1969-1983; G. A. Reshetneva, 1975; Yu. M. Nikolayev, 1976, and others). Efforts have been made to identify the differences in man's performance in the area of physical culture and other areas of public life, science, industry, art, the distinctions of social relations that become established between people in the area of physical culture (I. B. Vishnevskiy, 1974; N. I. Ponomarev, 1976, and others).

Investigation of Marxist-Leninist conceptions of culture and the cultural revolution plays an important part in gaining understanding of the essence of physical culture, its role and significance in society. This makes it possible to show the correlation and mutual influence of society and its physical culture in the course of historical development.

K. Marx and F. Engels viewed human culture as an integral phenomenon characterized by recognition of human endeavor as the basic source of development. Culture is expressed in the course of man's development of objective conditions and prerequisites for his endeavors and, thereby, in "creating" himself as the subject of endeavor. The substantive form of culture, which exists as the aggregate result of general human endeavor, is the simplest social form of development of culture. K. Marx wrote: "What was manifested in the form of activity on the worker's side now emerges, on the side of the product, in the form of a dormant property, form of being" [1].

V. I. Lenin viewed culture as one of the means that enable the masses to organize differently their production and government that provides for their physical and direct participation in social development. He repeatedly

stressed the need to combine it with revolutionary activity of the masses, their creative, economic, political and organizational work.

V. I. Lenin, in creatively developing Marxist theory, developed the teaching of socialistic culture and cultural revolution in the USSR.

Analysis of the sources available to us shows that physical culture, an inalienable part of the culture of the Vietnamese people, has always been notable for wide diversity. In addition, it developed in close contact with other aspects of culture--literature, art, dance, sculpture, etc.

However, before the revolution the French colonists used physical culture and sports in Vietnam in their own narrow-class interests as a means of detracting young people from the national revolutionary struggle.

Before the revolution, there were no regular physical education classes in secondary schools (particularly in schools attended by the children of workers). No types of national sports were developed, and they were considered solely as entertainment. For this reason, their actual contribution to the process of educating the people was extremely limited.

At the stage of building of socialism in Vietnam, physical culture started to be viewed as an element of general cultural work, a powerful means of communistic education of the Vietnamese people.

The communist party of Vietnam and public power deployed, from the very first days after the victory of the August (1945) revolution, a campaign to eradicate illiteracy, introduce work and physical education to the life of the people.

In the course of the armed struggle against the French colonists, the Vietnamese soldiers were able, thanks to daily exercise, to make long marches, transporting heavy objects, ammunition and weapons on their shoulders. The physical conditioning of Vietnamese partisans made no small contribution to the victory over the French colonists armed with the most modern combat equipment.

The SRV is a multinational state. The process of development of physical culture as an organic part of the entire culture of the Vietnamese people is consistently associated with increasing mutual enrichment of national cultures, active formation of conditions for building a socialist society. Their own experience, investigation of the achievements of socialist nations and, particularly, the USSR make it possible to build all work in the area of physical culture along modern theoretical ideological lines.

The communist party of Vietnam, under the guidance of which socialistic transformations are taking place, leans on Marxist-Leninist theory of building socialism and communism, and it makes extensive use of the knowhow of the USSR. Development of physical culture is an element of the process of development of society as a whole. President Ho Chi Minh wrote: "In order to work and learn successfully one needs good health and in order to preserve health one needs to exercise regularly. For this reason, we must develop the physical culture and sports movement everywhere" [6].

The Vietnamese communist party has defined the goals and tasks of physical culture that are consistent with the tasks of building socialism in the nation. Questions of strengthening health, physical development, education and comprehensive upbringing of the growing generation were among the main problems, from the very first days of the Vietnamese revolution, that required immediate solutions. For this reason, Le Zuan, general secretary of the KPV [communist party of Vietnam] Central Committee, stressed at the 5th KPV Congress in 1982 that "physical culture is an important element in the matter of building a new culture, a new type of man. The party and government must pay attention to development of physical culture as a means of strengthening the health of the people, a factor that is instrumental in forming traits in the new socialist man such as courage, stability, dexterity, wisdom, collective spirit and loyalty, which are needed to strengthen and protect the homeland" [3].

Chnong-Tin', general secretary of the communist party of Indochina (presently the Vietnamese communist party), in assessing the role of physical culture in the people's liberation struggle and building of socialism, stressed that the "physical culture and gymnastic movement has become an element of military training" [4].

In 1976, in his speech at a conference that summed up the achievements in deploying the sports movement in that country, Prime Minister Pham Van Dong indicated the need for broad propaganda of sports, the school of courage and creativity [5]. In Vietnam, physical education is directed not only toward comprehensive physical development, but raising the level of political awareness. In Vietnam, physical culture and sports activities are organically related to political education of the masses.

As a result of the national liberation struggle of the Vietnamese people, the KPV developed a systematic and distinct military political program based on Marxist-Leninist principles of analysis of domestic and foreign international situations, the knowhow of countries of the socialist alliance and traditions of the struggle of the Vietnamese people for independence. Much attention is devoted by the Vietnamese communist party to establishment of centers for applied-military forms of sports for young people, in order to strengthen the defense capacities of the nation.

The communist party and government of Vietnam show untiring concern about training specialists in all sectors of the national economy, science and culture, including physical culture and sports.

President Ho Chi Minh said: "Personnel are the foundation for everything. For this reason, personnel training is the chief concern of the party. The party must be concerned about training personnel, just like the orchard grower is concerned about trees dear to his heart, it should respect talents, respect specialists and all people who work for the benefit of our common cause" [5].

There must be a sufficient number of highly qualified specialists for further development of the the physical culture movement in the nation and to improve the quality of training coaches and athletes.

In 1960, by decision of the government, the Central Tekhnikum of Physical Culture was opened. In 1964, it was enlarged and reorganized into the Hanoi Institute of Physical Culture. In 1976, the Vietnamese government decided to open another tekhnikum of physical culture in Ho Chi Minh (Tekhnikum No 2). In 1979, the doors of a branch of the Institute of Physical Culture opened on the territory of this tekhnikum. In 1979, Tekhnikum of Physical Culture No 3 was opened in Da-Nang. In addition, the Pedagogic Institute of Physical Culture, Music and Art was founded under the Ministry of Education in 1967. In the 15 years of its existence, it turned out 1490 physical culture workers for secondary schools [7].

The Pedagogic Tekhnikum of Physical Culture in Ho Chi Minh, under the Ministry of Education, was opened in 1978.

To date, the Hanoi Institute of Physical Culture has trained 1761 specialists with higher education (including 138 coaches) and 2142 workers with secondary education [8].

The material and technical base of physical culture is being constantly upgraded in the SRV. The first sports centers intended for physical culture and recreation for the public have been built. As of 1981, there were 280 stadiums in Vietnam, including 6 with artificial lighting for nighttime activities. A total of 108 swimming pools have been constructed (high-level competitions can be held in 75 of them). Numerous athletic fields have been outfitted for factories, plants and state farms.

Physical culture has considerable possibilities for the formation of an integral, harmoniously developed, active and creative personality of a patriot.

At the stage of the building of socialism in Vietnam, physical culture is becoming one of the elements of an integral educational process. Physical culture, which is directly and indirectly aimed at physical improvement of man, participates actively in political, work and moral upbringing, in forming the spiritual wealth and moral purity of the Vietnamese people. Physical culture and sports are also instrumental in the successful process of socialization of developing generations.

Thus, in our country physical culture is very helpful in solving the problems put by the KPV Central Committee and Vietnamese government in the matter of building a socialist society.

## Conclusions

1. In the course of this investigation it was established that physical culture in Vietnam is characterized by the following basic distinctions:

The Vietnamese people has ancient traditions of national physical culture, which is an inherent part of its culture as a whole. It has found reflection, in particular, in national art (dances, art, graphics, sculpture).

For a long time, the Vietnamese people were under the rule of foreign invaders, which made it extremely difficult to develop their distinctive culture, in particular physical culture.

The revolutionary struggle, the struggle against foreign interventions and liberation wars caused a lag in some aspects of theory and practice of physical culture.

2. Problems of physical training and mass sports during the period of the liberation struggle were constantly in the field of vision of commanders and political workers of the Vietnamese Army. Solving them was important to the struggle of the Vietnamese people against foreign aggressors.
3. In the SRV, physical culture is developing in accordance with the general patterns of development of a socialist society and its historically formed culture. This is what determines its social essence.
4. The results of this study warrant the statement that Vietnamese culture, in its historical development, had a substantial effect on physical culture, while the latter, in turn, enriches the culture of society as a whole, being an area of socially necessary activity instrumental in development of social activities of the Vietnamese people.
5. The study of the historical experience of development of the physical culture movement in the USSR and nations of the socialist alliance, as well as the help of the Soviet Union in developing physical culture in Vietnam, are important to development of theory and practice of physical culture in SRV.
6. The material studied enable us to maintain that, at the present time, it is necessary to activate work to instill in the Vietnamese people a need for physical exercise. Party, government, public, youth and other organizations, as well as the press, radio and television, are called upon to solve these problems. All specialists in the field of physical culture and sports are also directly involved in performing these tasks.
7. The knowhow of the Soviet physical culture movement shows that, in its social functions and orientation, physical culture could be used more extensively as an important means of education.

This position is very important to SRV in the aspect of objectives of the ideological and cultural revolution.

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